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Noun and Verb Production in Maternal and Child Language: Continuity, Stability, and Prediction across the Second Year of Life

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Abstract

The present study examined continuity/discontinuity and stability/instability of noun and verb production measures in 30 child-mother dyads observed at 16 and 20 months, and predictive relations with the acquisition of nouns and verbs at 24 months. Children exhibited significant discontinuity and robust stability in the frequency of nouns and verbs between 16 and 20 months (over and above the contribution of maternal measures). By contrast, mothers showed small, but significant, increases in the total number of nouns and the percentages of nouns located in the initial and final utterance positions, together with a decrease in the percentage of verbs located in the initial position. After removing the variance explained by child language, mothers' speech was stable only in the percentages of nouns located in the initial and final utterance positions. Finally, children's production of nouns at 24 months was predicted by the percentages of nouns located in the initial and final positions of maternal utterances at 16 months. Maternal measures at 20 months did not predict children's production of nouns nor for verbs at 24 months. Implications for language acquisition are discussed.

Keywords

children; stability; continuity; nouns; verbs; language development

Introduction

The present study addresses questions of continuity/discontinuity and stability/instability of maternal and child language in the second year of life (Bornstein, Tamis-LeMonda, & Haynes, 1999). *Continuity* refers to consistency in mean language levels in a group of individuals over time, whereas *stability* refers to consistency in individual differences (i.e., in relative ranking) over time (Bornstein & Putnick, 2012; Bornstein, Hahn, Putnick, & Suwalsky, 2013). The study of these variables is central to language acquisition research, for

several reasons. First, it provides clues about the origin, nature, and future of a given language measure (Bornstein & Putnick, 2012). Second, discontinuity in children's language abilities is crucial in signalling developmental status to adults and caregivers, enabling them to adjust specific aspects of their input (Bornstein, Tal, Rahn, Galperin, Pêcheux, Lamour, Azuma, Toda, Ogino, & Tamis-LeMonda, 1992; McLaughlin, White, McDevitt, & Raskin, 1983; Pan, Imbens-Bailey, Winner, & Snow, 1996). Third, understanding whether maternal speech systematically changes as the child develops, and whether individual differences among caregivers persist over time, represents a preliminary but necessary step for all studies aimed at examining the relations of input language to vocabulary acquisition (Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007; Vibbert & Bornstein, 1989).

Previous research has examined these developmental issues with respect to global indices of vocabulary development (e.g., number of word types). Here we focused on measures of noun and verb production; moreover, we investigated continuity and stability of input language by considering both the total numbers of nouns and verbs produced by mothers and their positional salience of these parts of speech – that is, their occurrence in the initial, medial, and final positions of maternal sentences (Longobardi, Rossi-Arnaud, Spataro, Putnick, & Bornstein, 2015).

Continuity and Stability in Child and Mother Language

There is solid evidence indicating that children show strong stability of individual differences in general language development. Bornstein and Putnick (2012; see also Bornstein, Hahn, & Haynes, 2004; Bornstein, Hahn, Putnick, & Suwalsky, 2013; Bornstein, Putnick, & De Houwer, 2006), for instance, examined variations in multiple age-appropriate measures of child language derived from different sources, including transcripts of children's spontaneous speech in free-play and storytelling contexts, maternal questionnaires, and experimenter-administered tests. Structural equation modelling demonstrated that, at both 20 and 48 months of age, all of the above measures loaded on a single latent variable of language ability; moreover, a robust stability coefficient (0.84) was obtained between the latent variables at the two age points, irrespective of family socioeconomic status, maternal verbal intelligence, education, speech, and tendency to respond in a socially desirable fashion, and child social competence. Likewise, numerous studies in a variety of languages have documented discontinuity (i.e., significant increases) in children's vocabulary across the second year of life (Bates, Marchman, Thal, Fenson, Dale, Reznick, Reilly, & Hartung, 1994; Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994; for Italian, see: D'Odorico, Carubbi, Salerni, & Calvo, 2001; Longobardi, Rossi-Arnaud, & Spataro, 2011, 2012; Rescorla, Frigerio, Sali, Spataro, & Longobardi, 2014).

By contrast, the issues of continuity/discontinuity and stability/instability of maternal language are more controversial (Nelson, Bonvillian, Denninger, Kaplan, & Baker, 1984), in part because they depend on the specific properties taken into account. The present study is specifically focused on the analysis of *quantitative* aspects of input speech – i.e., individual variation in how much adults talk to children, as indexed by measures such as the total number of words produced by mothers and the number of different noun and verb types directed to children (Bornstein et al., 2004; Hoff & Naigles, 2002; Huttenlocher, Haight,

Bryk, Seltzer, & Lyons, 1991; Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007). The balance of evidence suggests that maternal speech exhibits minimal quantitative variation with child age in the first two years of life (Ling & Ling, 1974; Smolak, 1987). For example, Huttenlocher et al. (2007) observed no change across five longitudinal sessions (14, 18, 22, 26 and 30 months) in three quantitative measures of caregivers' language (word tokens, number of utterances and number of sentences), and Rowe (2012) found no significant increases in the number of word tokens directed to children from 18 to 30 to 42 months of age. Even when detected, quantitative variation is small in magnitude (Pan et al., 1996), or reaches significance only in early periods of development (Suttora & Salerni, 2011). Bornstein et al. (1999), for instance, reported that the productive vocabulary (the total number of word roots) of 13- and 20-month-olds' mothers increased from 182 to 191 words in a play context.

Analogous incomplete understanding exists with respect to the stability of maternal measures. Smolak (1987) found no significant correlations between the total number of utterances produced by mothers at 10, 14, and 18 months, and Huttenlocher et al. (2007) reported that caregivers did not maintain their relative ranking on quantitative measures of child-directed-speech. By contrast, significant short-term stability was obtained by Henning, Striano, and Lieven (2005) for individual differences in the rates of maternal utterances (i.e., the number of words per minute) between 1 and 3 months of age. Likewise, Bornstein et al. (1999) found that mothers were stable in the numbers of word roots they produced between 13 and 20 months, independent of the number of word roots produced by their children.

The Present Study: Aims and Predictions

The present study examined the continuity and stability of maternal and child language more thoroughly, by analyzing spontaneous speech in a sample of 30 Italian child-mother dyads observed longitudinally between 16 and 24 months of age. We analyzed continuity and stability with respect to parts of speech, specifically the production of nouns (i.e., words denoting individuated concrete objects) and verbs (i.e., words referring to imageable actions and events situated in time). Moreover, we examined both the total number (the frequency) of nouns and verbs produced by mothers and their relative position in maternal utterances (initial, medial, or final).

The first aim was to investigate continuity and stability in the total numbers of nouns and verbs uttered by mothers between 16 and 20 months – a question not directly addressed in the aforementioned studies because measures such as the total number of words produced by caregivers conflate different lexical categories (Bornstein et al., 1999; Henning et al., 2005; Huttenlocher et al., 2007; Rowe, 2012). The second year of life is an important period for early language development, when most children have already acquired a basic vocabulary of concrete, highly imageable nouns (Gleitman, Cassidy, Papafragou, Nappa, & Trueswell, 2005; McDonough, Song, Hirsh-Pasek, Golinkoff, & Lannon, 2011) and are transitioning towards the use of word-word and word-gesture combinations (Bates & Dick, 2002). This is also the time when the production of relational terms like verbs begins to increase (Bates et al., 1994; Bornstein et al., 2004; Caselli et al., 1995; Fenson et al., 1994), signaling children's emergent knowledge of the syntactic properties of the input language (Gleitman et

al., 2005). However, recent experimental studies with 24-month-old English-, Mandarin- or Korean-speaking children have confirmed that they have considerably more difficulty in mapping novel verbs to event categories than novel nouns to object categories (Arunachalam, Leddon, Song, Lee, & Waxman, 2013; Arunachalam & Waxman, 2011). In this paradigm, infants viewed a dynamic scene (e.g., a girl petting a dog) while listening to either a novel noun ("The girl is petting the *blick*") or a novel verb ("The girl is *blicking* the dog"). On a later test, children were presented with two new scenes, involving a change in the object (e.g., a girl petting a *ball*) or in the action (e.g., a girl *kissing* the dog). The results showed that performance with novel nouns was uniform and robust, with infants focusing on the test scenes depicting the same object. By contrast, performance with novel verbs was less robust and cross-linguistically more variable, because children often failed to focus on the test scene depicting the same action.

The hypothesis we tested is that Italian-speaking mothers exhibit moderate stability and significant discontinuity in noun measures. Our expectation follows from previous findings indicating that: a) during the first 2 years of life, Italian-speaking children produce significantly more nouns than verbs (Bornstein et al., 2004; Camaioni & Longobardi, 1995; Caselli et al., 1995; D'Odorico et al., 2001; Longobardi et al., 2015; see Waxman et al., 2013, for a review); and b) variation in the frequency of nouns in maternal language predicts children's acquisition of this lexical category (Goodman, Dale, & Li, 2008; Longobardi et al., 2015). If continuity and stability in input speech are critical to support lexical acquisition (Bornstein et al., 1999; Huttenlocher et al., 2007), then we should expect Italian-speaking mothers to show both an age-related increase and significant stability in the total number of noun types. By contrast, we did not expect significant stability and/or increases in the total number of input verbs, because Italian-speaking mothers are already known to address more verb than noun types and tokens to children between 16 and 20 months of age (Camaioni & Longobardi, 2001; Longobardi et al., 2015).

The second aim of the present study was to determine possible differences in the continuity and stability of input nouns and verbs as a function of their relative position in maternal utterances. Theory and data alike suggest that nouns appearing at the edges of maternal utterances (especially in the final position) are learned earlier than those appearing in medial positions, perhaps because the former are segmented and recognized more easily (Gentner, 1982; Gentner & Boroditsky, 2001; Golinkoff & Alioto, 1995; Longobardi et al., 2015; Seidl & Johnson, 2006; Shady & Gerken, 1999). Italian is a PRO-DROP language allowing null subjects in SVO sentences: As a consequence, verbs appear in the initial and medial positions of caregivers' utterances more frequently than do nouns, whereas nouns occur in the final position more often than do verbs (Camaioni & Longobardi, 2001; Longobardi et al., 2015; Tardif et al., 1997). In a previous study, Longobardi et al. (2015) reported that the percentages of nouns occurring in the final position of maternal utterances at 16 months significantly predicted the number of noun types produced by children at 20 months. Therefore, we expected Italian-speaking mothers to exhibit an age-related increase and significant stability in the frequency of nouns in their utterance-final positions. Regarding verbs, Longobardi et al. (2015) reported no significant association between the percentages of verbs occurring in the initial, medial, and final positions of maternal utterances at 16 months and the number of verbs produced by children at 20 months. However, other

experimental findings suggest that, by 19 months of age, caregivers' use of SVO utterances (in which verbs are located in the central position) facilitates children's understanding of the relational meanings of verbs, by providing them with rich contexts specifying both actors and objects (Arunachalam & Waxman, 2011; Imai, Li, Haryu, Okada, Hirsh-Pasek, Golinkoff, & Shigematsu, 2008; Saffran, 2001). Hence, we expected Italian-speaking mothers to show significant stability in the frequency of verbs occurring in the utterance-central position.

The third and last aim of our study was to investigate relations between the observational measures of input speech at 16 and 20 months and the estimates of children's noun and verb production at 24 months, as assessed with the Italian version of the MacArthur-Bates Communicative Development Inventory Caselli & Casadio, 1995). Based on the literature briefly reviewed above, we predicted that: a) children's production of nouns at 24 months should be positively correlated with the frequency of nouns they hear in the final position of maternal utterances at 16 and 20 months (Golinkoff & Alioto, 1995; Longobardi et al., 2015; Seidl & Johnson, 2006; Shady & Gerken, 1999); and b) children's production of verbs at 24 months should be positively correlated with the frequency of verbs they hear in the medial position of maternal utterances at 16 and 20 months (Arunachalam & Waxman, 2011; Imai et al., 2008).

Method

Participants

Thirty Italian monolingual full-term children (14 boys) and their mothers participated in the study. All families were recruited from child-care nurseries or paediatricians' offices and were Italian native speakers, middle socioeconomic status, and lived in Rome. Seventeen children were first-born, whereas the remaining 13 children were second or later born. None was reported to have health or linguistic risk conditions. The mean age of mothers was 34.4 years ($SD = 3.5$; range: 30–45): 10 had a university degree, and 20 had a high-school diploma.

Procedures

Mother-child dyads were video-recorded at home when children were approximately 16 months ($M = 15.5$; range = 14.7–15.9) and 20 months ($M = 19.9$; range = 18.2–20.3). Each session consisted of 15 min of play with familiar toys.

At 24 months, mothers completed the Toddler form of the Italian version of the MacArthur-Bates Communicative Development Inventory (CDI: Words and Sentences; *Il Primo Vocabolario del Bambino: Parole e Frasi*: Caselli & Casadio, 1995).

Measures of Maternal and Child Language

For both maternal and child language, coding was carried out by two independent trained coders who were Italian native speakers and had backgrounds in linguistics. Reliability averaged 85%. Cases of disagreement were discussed with the first author to reach perfect agreement on all measures.

Maternal Measures—Measures of maternal and child language at 16 and 20 months were derived from transcripts of the recorded sessions. For each mother, all the utterances produced during play with familiar toys were identified. To be included in the same utterance, words were separated by a pause of less than 1 sec (D’Odorico et al., 1999). Maternal language at 16 and 20 months was coded for: (a) the total number of words produced (a measure of verbosity); (b) the total number of noun and verb types; (c) the percentages of utterances containing nouns and verbs in the initial, medial, and final positions; and (d) the percentages of utterances containing isolated nouns and verbs (Tardif et al., 1997). The inclusion of the last measure is justified by previous studies indicating that the frequency with which a child hears a word in isolation predicts the acquisition of that word (Brent & Siskind, 2001).

Following Tardif (1996), a strict criterion was employed in the analysis of both maternal and child language, counting only common nouns and main verbs, and excluding proper nouns, auxiliaries, and copulas. Noun and verb types were defined by the form of their stems, so that plurals and declinations were considered as different words (Camaioni & Longobardi, 2001). The percentages of maternal sentences containing nouns and verbs in the initial and final positions were computed from all utterances containing at least two words; for the percentages of maternal sentences containing nouns and verbs in the medial position, only utterances with at least three words were taken into account because this position cannot be defined for two-word utterances (Longobardi et al., 2015). Nouns and verbs were counted as initial position if they were not preceded by any other word, including articles and function words; likewise, they were counted as final position if no other word followed them (Au et al., 1994; see Longobardi et al., 2015, for examples and additional details). We limited our analyses to types because the primary debate has focused on the predominance of noun types (not tokens) in children’s early vocabularies (Gentner, 1982; Tardif, Gelman, & Xu, 1999).

Child Language—Measures of child language at 16 and 20 months were computed from all available single- and multiple-word utterances because the amount of speech produced by children at those ages is highly variable and many children are still learning to combine words. Children’s productive speech was coded for: (a) the total number of words produced and (b) the total number of noun and verb types.

At 24 months, mothers were asked to indicate all the words their children spontaneously produced on the Toddler form of the Italian version of the MacArthur-Bates CDI. This parent-report questionnaire comprises a vocabulary checklist of 680 words, including common nouns, verbs, and adjectives. For the present purposes, three measures were coded: the total vocabulary size and the number of nouns and verbs attributed to children. The latter two variables were transformed into opportunity scores by dividing by the total numbers of nouns and verbs, respectively, included in the CDI. All words falling into the sections Animals, Vehicles, Toys, Food, Clothes, Body, Small Household Objects, Furniture, Outside Things, and Places were summed to form the total number of “common nouns”, whereas only the words falling into the section Actions were used to compute the total number of “main verbs” (see Tardif et al., 1999, Note 2, for a similar procedure). Opportunity scores were utilized to ensure that individual differences in children’s production of nouns and

verbs were not affected by differences in the size of the two categories in the CDI (typically, nouns are over-represented in parent-report questionnaires: Papaeliou & Rescorla, 2011).

Results

Before analysis, variable distributions were examined for univariate normality (Tabachnick & Fidell, 2007). Some measures did not approximate the normal distribution (i.e., values of skewness and/or kurtosis were greater than ± 1.0). As a consequence, continuity and stability in child and maternal language were assessed using both parametric (*t*-tests for paired samples for continuity and Pearson correlations for stability) and non-parametric statistics (Wilcoxon signed ranks test for continuity and Spearman's *rho* for stability). Because the two sets of analyses led to comparable conclusions, only the results of the parametric statistics are reported.

To control for multiple significance testing in the correlational analyses, we adopted the procedure illustrated by Benjamini and Hochberg (1995), which calls for the identification of the false discovery rate – i.e., the expected proportion of falsely rejected hypotheses. Briefly, for each subset of correlations, we ordered the corresponding $p_{(i)}$ values in descending order of magnitude and denoted k as the largest i for which $p_{(i)} \leq (i/m) \cdot \alpha$, where m is the total number of correlations being tested and $\alpha = 0.05$. Then, we accepted as significant all the correlations for which $p_{(i)} \leq k$. This method avoids some of the difficulties encountered with classical multiple-comparison procedures (i.e., Bonferroni-type procedures), and is therefore recommendable. In particular, it allows to test families of hypotheses based on statistics of different types or non-normal statistics, and does not involve a power decrease (when compared with single-comparison problems: see Benjamini & Hochberg, 1995, for discussion).

Continuity of maternal measures

Overall, mothers produced 220.33 and 203.13 utterances at 16 and 20 months, respectively. Of these, the percentages of one-word, two-word and three-or-more-word utterances were: 46.06%, 17.90% and 35.85% at 16 months, and 41.35%, 19.95% and 38.18% at 20 months.

Table 1 (upper panel) shows descriptive statistics for maternal measures at 16 and 20 months, together with the results of paired-samples *t*-tests. Small but significant (or marginally significant) increases were found for the total number of noun types, and the percentage of maternal utterances containing nouns in the initial and final positions. By contrast, the percentage of maternal utterances containing verbs in the initial position decreased from 16 to 20 months.

Stability of maternal measures

Table 1 (upper panel) also reports Pearson zero-order correlations between maternal measures at 16 and 20 months. Stability was significant for the total number of words produced, the total number of noun types, and the percentages of maternal utterances containing nouns in the initial and final positions. The correlation between the percentages of maternal utterances containing verbs in the medial position at 16 and 20 months was marginally significant. However, after applying the Benjamini and Hochberg (1995)

correction to the subsets of noun and verb correlations, stabilities remained significant only for the percentages of maternal utterances containing nouns in the initial and final positions.

Continuity of child measures

Descriptive statistics for children's measures are given in the bottom panel of Table 1, together with the results of *t*-tests for paired samples. Not surprisingly, children exhibited substantial increases between the two age points in the total number of words produced as well as in the numbers of noun and verb types.

Stability of child measures

Pearson correlations for children's observational measures at 16 and 20 months are also reported in the bottom panel of Table 1. Stabilities were robust for the total number of words and the number of verb types; for the number of noun types, stability was medium-to-large in size.

As concerns relations between the observational measures at 16 and 20 months and the three parent-report variables derived from the Italian version of the CDI at 24 months, the upper panel of Table 2 shows significant correlations in all cases, confirming that children's language remained stable during this 8-month period, even when assessed with different methods.

All of the above correlations remained significant after adjusting for multiple testing.

Hierarchical regressions: Stability of child language, controlling for maternal language

Hierarchical regressions were performed to ascertain whether stability in children's language measures held over and above individual differences in maternal production of noun and verb types and their overall talkativeness (Bornstein et al., 1999).

Table 3 shows that the total number of words produced by children at 16 months significantly predicted their number of words at 20 months, after removing the variance explained by the total number of words produced by mothers at 16 months. Similar findings were observed for the more specific measures of noun and verb types. Children's numbers of noun and verb types at 20 months were significantly predicted by their number of noun and verb types produced at 16 months, above and beyond the contribution due to mothers' numbers of noun and verb types at 16 months.

Hierarchical regressions were also performed for the proportions of nouns and verbs attributed to children in the CDI at 24 months. The results, reported in Table 4, indicate that the CDI estimates of children's vocabulary at 24 months were significantly predicted by the total number of words produced by the same children at 16 and 20 months, after partialling out the variance accounted for by maternal talkativeness at the same ages. Likewise, children's opportunity scores for nouns and verbs at 24 months were significantly predicted by the numbers of noun and verb types they produced at 16 and 20 months, independent of the contribution of noun and verb types uttered by mothers at the same ages (16 and 20 months, respectively).

Hierarchical regressions: Stability of maternal language, controlling for child language

For maternal language, hierarchical regressions were conducted for the total number of words, the total number of noun types, and percentages of utterances containing nouns in the initial and final positions and verbs in the medial position because these were the only variables that showed significant, or marginally significant, stability between 16 and 20 months (see Table 1). The aim was to ascertain whether these maternal measures continued to be stable after controlling for children's language.

As shown in Table 5, after controlling for the number of noun types produced by children at 16 months, the predictive relations between the percentages of nouns occurring in the initial and final positions of maternal utterances at 16 and 20 months remained significant. By contrast, the total numbers of words and noun types produced by mothers at 20 months were only marginally predicted by the corresponding numbers of words and noun types produced at 16 months, after removing the variance explained by children's words and noun types at 16 months ($\beta = 0.35$, $p = 0.069$ and $\beta = 0.34$, $p = 0.066$, respectively). Finally, the predictive relation between the percentages of maternal utterances containing verbs in the medial position at 16 and 20 months (which was already marginal in the correlational analysis: see Table 1) remained marginally significant after eliminating the contribution of children's verb types at 16 months.

Pearson Correlations between maternal language and child CDI measures

The last aim of the present study was to ascertain whether maternal measures at 16 and 20 months correlated with CDI estimates of child language at 24 months. The bottom panel of Table 2 shows that Pearson correlations were generally low and non-significant, with some notable exceptions. In particular, children's noun opportunity scores at 24 months were positively associated with the percentages of nouns occurring in the initial and final positions of their mothers' utterances at 16 and 20 months. After applying the Benjamini and Hochberg (1995) correction, only the correlations with the percentages of nouns located in the initial position at 16 months and the final position at 20 months remained significant.

In addition, children's verb opportunity scores at 24 months were: a) positively correlated with the percentages of maternal utterances containing verbs in the medial position and isolated verbs at 20 months but b) negatively correlated with the percentage of verbs occurring in the initial position of maternal utterances at 20 months. These correlations remained significant after adjusting for multiple testing.

To further corroborate the predictive role of maternal language for children's acquisition of nouns and verbs, we conducted a series of hierarchical regressions. Table 6 shows that children's noun opportunity scores at 24 months were significantly predicted by the percentages of maternal utterances containing nouns in the initial and final positions at 16 months, over and above the variance explained by the numbers of noun types produced by the same children at 16 months. However, maternal measures at 20 months had a negligible impact on children's noun and verb opportunity scores at 24 months: in these cases, the only significant predictors were the number of noun and verb types produced by the children themselves at 20 months.

Discussion

The present study examined the continuity and stability of maternal and child language, and the predictive relations between them, in a sample of 30 mother-child dyads followed longitudinally between 16 and 24 months of age. Unlike previous studies, we focused on the frequency and positional salience of nouns and verbs, two grammatical categories that are critical for vocabulary growth during the first 2 years of life (Bornstein et al., 2004; Gentner & Boroditsky, 2001; Longobardi et al., 2015; Waxman et al., 2013). The investigation of these issues may provide important clues about the early development of child language and its relations with maternal speech. In many Western cultures (including Italian), children show a predominance of nouns over verbs, both in production (Bornstein et al., 2004; Gentner, 1982; Gentner & Boroditsky, 2001; Waxman et al., 2013) and in comprehension (Arunachalam et al., 2013; Arunachalam & Waxman, 2011), and nouns constitute the largest portion of productive vocabulary throughout the second year of life (Bates et al., 1994; Bornstein et al., 2004; D'Odorico et al., 2001). However, in this same period verb production increases more rapidly than noun production, both in English and in Italian (Bates et al., 1994; D'Odorico et al., 2001). These findings raise the question of the degree to which advances in children's acquisition of nouns and verbs are paralleled by age-related variations in the continuity and stability of maternal language.

We found that: maternal language underwent small but significant changes between 16 and 20 months in the percentages of nouns located in the utterance-initial and final positions (which increased) as well as in the percentages of verbs located in the utterance-initial position (which decreased); mothers exhibited moderate stability between 16 and 20 months in the total numbers of words and noun types they produced and in the percentages of nouns they located in the initial and final utterance positions; children's language showed both discontinuity (i.e., age-dependent increases) and stability in the production of noun and verb types between 16 and 24 months of age, irrespective of the evaluation methods – direct observations or parent-report questionnaires; after eliminating the variance explained by maternal measures, children's language remained stable in the total number of words and in the noun and verb types they produced between 16 and 20, 16 and 24, and 20 and 24 months; after controlling for the influence of child measures, significant stability of maternal language between 16 and 20 months was achieved only in the percentages of nouns located in the initial and final utterance positions; and children's noun opportunity scores at 24 months were significantly predicted by the percentages of nouns located in the initial and final positions of maternal utterances at 16 months (after controlling for children's noun types at 16 months). We discuss the theoretical and practical implications of these findings in the balance of this section.

Continuity and Stability of Maternal Language

Despite the narrow interval between the two observational sessions, the present data indicate that small variations in the quantitative aspects of input language occur between 16 and 20 months of age. As noted earlier, there is no clear consensus in literature about this question, because some studies have reported no changes in the structural measures of child-directed speech during the second year of life (Huttenlocher et al., 2007; Ling & Ling, 1974; Rowe,

2012; Smolak, 1987), whereas other studies have reported significant adjustments with increasing child age (Bornstein et al., 1992, 1999; Kaye, 1980; Pan et al., 1996; Suttora & Salerni, 2011). In agreement with the latter results, here we found that Italian-speaking mothers tended to use a larger percentage of noun types with their children, as their children got older, and produced significantly more utterances in which nouns were located in the salient initial and final positions at 20 than at 16 months. Importantly, the analysis of correlations with children's CDI measures at 24 months and the follow-up hierarchical regressions strongly suggest that these positional variations predicted the development of children's language at 24 months, because the percentages of nouns located in the initial and final positions of maternal utterances at 16 months significantly related to noun opportunity scores at 24 months.

Previous studies have clearly demonstrated that children identify and learn words located in the salient final position of their mothers' utterances better than those located in the medial position (Gentner, 1982; Seidl & Johnson, 2006; Shady & Gerken, 1999); the same is true of adults acquiring a second language (Golinkoff & Alioto, 1995). Recency effects may be the source of the advantage of the final position (Cornell & Bergstrom, 1983; Gulya, Rovee-Collier, Galluccio, & Wilk, 1998), but the benefit appears to be specific to nouns, because no significant correlations were observed between the percentages of maternal utterances containing verbs in the final position at 16 and 20 months and the CDI estimates of children's verb production at 24 months (see Longobardi et al., 2015, for further discussion). As concerns the percentages of nouns located at the beginning of maternal utterances, the narrow range of variation suggests caution in interpretation. Nonetheless, our findings accord with Gentner (1982)'s claims as well as with experimental evidence proving that children as young as 7–8 months recognize words from the utterance-initial position as readily as they do from the utterance-final position (Seidl & Johnson, 2006).

The results of the analyses of the stability of maternal language were also largely consistent with our predictions, because significant correlations between 16 and 20 months were mostly obtained for noun measures – the total number of noun types and the percentages of nouns occurring in the initial and final positions of maternal utterances. Furthermore, for the latter two measures significant stability was achieved even after controlling for the number of noun types produced by children at 16 months. In contrast, the percentages of verbs located in the medial position of maternal utterances showed only marginal stability between 16 and 20 months. Taken together, these findings point to the conclusion that maternal concordance in the frequency of nouns in specific utterance positions is likely to provide infants with a stable background that facilitates acquisition of this basic lexical category (Gentner, 1982).

As mentioned, Italian is a PRO-DROP language allowing null subjects (Bornstein et al., 2004; Camaioni & Longobardi, 2001; Longobardi et al., 2015). Therefore, two types of sentences are widely employed in Italian maternal speech: the incomplete VO structure (“*Batti le mani*”: “Clap your hands!”) and the more complete SVO structure (“*La bambola batte le mani*”: “The doll claps the hands”). The significant decrease in the frequency of input verbs located in the utterance-initial position between 16 and 20 months may suggest that, as children's linguistic competence increases, mothers' use of the VO structure tends to

diminish. Such a positional adjustment appears to have consequences for infants' verb learning, as indicated by the negative correlation between the percentages of maternal utterances containing verbs in the initial position at 20 months and children's CDI verb scores at 24 months. Conversely, the children of mothers who produced more SVO utterances were reported to produce a greater number of verbs – as indicated by the positive correlation between the percentage of maternal utterances containing verbs in the medial position at 20 months and children's CDI verb scores at 24 months. This latter finding comports with experimental evidence demonstrating that young infants rely on information from surrounding nouns to learn the meaning of verbs (Arunachalam & Waxman, 2011; Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005). English-speaking children, for instance, are better able to map novel verbs to their corresponding actions when they view dynamic scenes (e.g., a woman who is rolling a football-shaped Frisbee between the palms of her hands) and are simultaneously presented with sentences in which the surrounding nouns are explicitly mentioned (rich linguistic contexts: e.g., "Look! She is rolling it!"), than when they are presented with sentences in which the nouns are dropped (sparse linguistic contexts: e.g., "Look! Rolling"; Imai et al., 2008; Waxman et al., 2013). Therefore, the present data suggest that, for Italian-speaking infants between 20 and 24 months of age, hearing an input with a high frequency of complete SVO utterances facilitates verb acquisition, whereas hearing an input with a high frequency of incomplete VO utterances hinders verb learning. At the same time, we note that maternal measures of verb positional salience (i.e., the percentages of utterances containing verbs in the initial and medial positions) at 20 months did not predict, or only marginally predicted, children's verb scores at 24 months. Clearly, additional studies are needed to further corroborate any conclusions.

A similar conclusion can be drawn for the role of isolated verbs in maternal language. Previous studies have found that the frequency of isolated words in maternal language predicts their ease of acquisition in children between 9 and 15 months of age. Our correlational findings suggests that, in slightly older children (from 20 to 24 months), the facilitatory role of isolated words might be stronger for verbs than for nouns. However, the percentages of isolated verbs in maternal speech at 20 months did not significantly predict the children's CDI verb scores at 24 months, when the influence of child language (at 20 months) was taken into account.

Continuity and Stability of Child Language

As expected, Italian-speaking children exhibited robust discontinuity (i.e., age-related increases) and stability in the production of nouns and verbs between 16 and 24 months (Camaioni & Longobardi, 1995; Caselli et al., 1995; D'Odorico et al., 2001; Longobardi et al., 2015). More importantly, they maintained their relative rank order after controlling for the number of noun and verb types produced by their mothers. In this respect, our results extend to an earlier age period the findings reported by Bornstein and Putnick (2012) with children between 20 and 48 months, and confirm that infants show a remarkable stability of their language abilities in the first 2 years of life (Bornstein et al., 2004, 2006). In line with the present findings, a study by D'Odorico et al. (2001) examined individual differences and lexical composition in 42 children at fixed stages of vocabulary size (50, 100, and 200 words), and found that, in the passage from the first to the second 100 words (roughly

equivalent to the vocabulary size of our children at 16 and 20 months), infants showed stability in the production of both nouns and verbs (+0.73 and +0.49, respectively).

Overall, the picture emerging from the regression analyses on the CDI measures suggests that, starting from about 20 months of age, advances in productive vocabulary are primarily driven by the child, who uses the skills he/she has already acquired to extract and learn new linguistic information from input speech. Indeed, the best predictors of children's CDI estimates of noun and verb knowledge at 24 months were the number of nouns and verbs produced by the same children at 20 months, with maternal measures having a negligible influence. By contrast, at 16 months both the number of nouns produced by children and the frequency of nouns in the initial and final positions of maternal utterances predicted children's CDI noun scores at 24 months. These findings are consistent with a number of hypotheses stating that children between 16 and 20 months of age use maternal input and the observation of a word's situational contingencies (i.e., the co-occurrences of a word and its concrete referent) to construct a foundational vocabulary of concrete, highly imageable nouns (Gentner, 1982; Gentner & Boroditsky, 2001; Gleitman et al., 2005). Having an initial stock of basic-level terms plays a necessary role in later language acquisition (from 20 months, by providing children with the first basis to understand the rudiments of the clause-level syntax of their languages, which in turn becomes a powerful source of evidence for constraining the meaning of those words that cannot be acquired by observation alone, such as relational verbs and more abstract nouns (Gleitman, 2005; Snedeker & Gleitman, 2004). These accounts correctly predict that the scaffolding role of maternal speech should decrease as the children's lexical and syntactic knowledge increases. At the same time, it must be acknowledged that a number of maternal characteristics, such as socioeconomic status, verbal intelligence, and knowledge of child development, continue to affect 20-month child vocabulary via maternal speech (Bornstein, Haynes, & Painter, 1998; Hoff, 2003).

Excessive emphasis on the active role of infants must also be moderated by considering that we only analyzed structural (i.e., quantitative) aspects of maternal language, whereas its qualitative (stylistic and pragmatic) properties may exert an additional impact on early vocabulary development (Huttenlocher et al., 2007). Rowe (2012), for instance, showed that, after controlling for parent education, previous child vocabulary skill, and parent input quantity (word tokens), the mothers' use of diverse and sophisticated vocabulary and decontextualized language (e.g., narrative) at 30 months explains additional variance in children's vocabulary at 42 and 54 months. Similarly, Naigles and Hoff-Ginsberg (1998) reported that the diversity of syntactic environments in which a set of 25 verbs appeared in input speech predicted their order of acquisition in a sample of children between 16 and 25 months of age. Hence, the contribution of maternal language might have been stronger, if we had taken into account both quantitative and qualitative measures.

Another important limitation of the present study is that our measures were derived from both direct observations (at 16 and 20 months) and indirect parent-report questionnaires (at 24 months). However, there are reasons to believe that this procedural choice did not unduly affect the results. First, we found high and significant correlations between the estimates of child language obtained with the two methods (see Table 2), replicating previous results in English (Dale, 1991; Dale, Bates, Reznick, & Morissett, 1989; Fenson et al., 1994) and in

Italian (Camaioni & Longobardi, 1995). Second, the outcomes of the regression analyses on the CDI scores (see Table 7) did not conform to a simple methodological explanation, because significant predictive relations were observed with maternal measures at 16 months, but not with maternal measures at 20 months – if our results were simply due to the use of different methods, we would have expected the opposite pattern (less time elapses between 20 and 24 months, than between 16 and 24 months).

Future studies could advance our understanding of the complementary roles of continuity/discontinuity and stability/instability of maternal and child speech in the early phases of language development in at least three ways: by increasing sample size, by extending the period of investigation to earlier and later ages, and by comparing differences and similarities across different languages.

Conclusions

In summary, the present study showed that, for Italian-speaking children between 16 and 24 months of age, advances in the acquisition of nouns and verbs are accounted for by a number of factors. Infants' abilities at earlier age points (16 or 20 months) explain the greatest portion of variance in their later (24-month) production of the two word categories. However, specific aspects of maternal speech, like the age-related increase and the moderate stability in the percentages of utterances containing nouns in the initial and final positions between 16 and 20 months, contributed to noun production at 24 months. In agreement with extant literature, we proposed that nouns located in salient positions (particularly the final one) are more easily extracted and remembered by young infants (Golinkoff & Alioto, 1995; Seidl & Johnson, 2006; Shady & Gerken, 1999). In addition, we found that the CDI verb scores at 24 months were positively correlated with the percentages of verbs located in the medial positions of maternal utterances at 20 months, but negatively correlated with the percentages of verbs located in the initial position. To account for these findings, we proposed that SVO utterances facilitate children's understanding of the relational meaning of verbs by allowing them to rely on information provided by the surrounding nouns.

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Table 1

Mother and child measures at 16 and 20 months, along with paired-sample *t*-tests and Pearson's correlations assessing continuity and stability. Standard deviations are given in parenthesis.

Mother Measures	16 Months	20 Months	Continuity	Stability
<i>General</i>				
Total Number of Words	398.47 (27.77)	406.80 (34.82)	$t = 1.28$	$r = 0.37^*$
<i>Nouns</i>				
Types	25.67 (7.69)	28.26 (5.78)	$t = 1.85^{\dagger}$	$r = 0.38^*$
Initial Position (%)	0.63 (0.92)	1.13 (1.25)	$t = 2.28^*$	$r = 0.45^*$
Medial Position (%)	10.36 (5.93)	11.47 (5.41)	$t = 0.84$	$r = 0.23$
Final Position (%)	35.40 (7.86)	39.53 (9.02)	$t = 2.33^*$	$r = 0.41^*$
Isolated (%)	2.43 (1.52)	3.33 (3.42)	$t = 0.90$	$r = -0.09$
<i>Verbs</i>				
Types	47.13 (8.55)	49.80 (7.17)	$t = 1.45$	$r = 0.18$
Initial Position (%)	32.30 (13.77)	23.73 (8.17)	$t = -3.22^{**}$	$r = 0.20$
Medial Position (%)	34.46 (8.87)	34.23 (5.70)	$t = 0.11$	$r = 0.34^{\dagger}$
Final Position (%)	23.93 (5.54)	24.73 (5.46)	$t = 0.53$	$r = -0.17$
Isolated (%)	9.60 (3.54)	9.55 (2.24)	$t = 0.06$	$r = 0.22$
Child Measures				
Total Number of Words	77.10 (69.33)	218.03 (134.13)	$t = 7.56^{***}$	$r = 0.67^{***}$
Noun Types	6.75 (7.73)	26.90 (20.80)	$t = 5.82^{***}$	$r = 0.41^*$
Verb Types	1.47 (1.75)	11.22 (11.46)	$t = 5.08^{***}$	$r = 0.60^{***}$

Note.

$^{\dagger} 0.05 < p < 0.10$;

$^* p < 0.05$;

$^{**} p < 0.01$;

$^{***} p < 0.001$.

Table 2

Pearson's correlations assessing stability between child observational measures at 16 and 20 months and the CDI variables at 24 months.

	CDI Measures (24 months)		
	Vocabulary	Nouns	Verbs
Child Measures			
<i>Observed: 16 Months</i>			
Total Number of Words	0.59 ***	0.56 ***	0.55 **
Noun Types	0.59 ***	0.56 **	0.55 **
Verb Types	0.61 ***	0.57 **	0.58 **
<i>Observed: 20 Months</i>			
Total Number of Words	0.78 ***	0.73 ***	0.74 ***
Noun Types	0.89 ***	0.86 ***	0.90 ***
Verb Types	0.90 ***	0.84 ***	0.87 ***
Mother Measures			
<i>Nouns 16 Months</i>			
Noun Types	0.23	0.18	0.24
Initial Position	0.39 *	0.44 **	0.35 †
Medial Position	0.04	0.05	0.11
Final Position	0.41 *	0.40 *	0.41 *
Isolated Nouns	0.02	0.01	0.08
<i>Nouns 20 Months</i>			
Noun Types	0.35 †	0.36 *	0.33 †
Initial Position	0.29	0.32 †	0.18
Medial Position	0.16	0.17	0.05
Final Position	0.47 **	0.47 **	0.46 *
Isolated Nouns	-0.05	-0.07	-0.01
<i>Verbs 16 Months</i>			
Verb Types	-0.01	-0.08	0.04
Initial Position	0.02	-0.09	-0.02
Medial Position	-0.07	-0.11	-0.05
Final Position	-0.12	-0.14	-0.15
Isolated Verbs	0.17	0.11	0.10
<i>Verbs 20 Months</i>			
Verb Types	0.08	0.11	0.16
Initial Position	-0.38 *	-0.37 *	-0.42 *
Medial Position	0.42 *	0.41 *	0.50 **
Final Position	0.06	0.09	0.11
Isolated Verbs	0.51 **	0.52 **	0.44 *

Note. $\dagger 0.05 < p < 0.10;$ $^* p < 0.05;$ $^{**} p < 0.01;$ $^{***} p < 0.001.$

Hierarchical regressions testing the stability of child measures between 16 and 20 months, after removing the contribution of mother measures.

Table 3

<i>Dependent Measure</i>	<i>Predictors</i>		<i>R²</i>	<i>AdjR²</i>	<i>R²</i>	<i>Final β</i>
Child Total Number of Words (20 months)	<i>Step 1</i>		0.05	0.02	0.05	
		Mother Total Number of Words (16 months)				0.22
	<i>Step 2</i>		0.39	0.35	0.34***	
		Mother Total Number of Words (16 months)				0.04
Child Noun Types (20 months)		Child Total Number of Words (16 months)				0.62***
	<i>Step 1</i>		0.07	0.03	0.07	
		Mother Noun Types (16 months)				0.26
	<i>Step 2</i>		0.21	0.15	0.14*	
Child Verb Types (20 months)		Mother Noun Types (16 months)				0.19
		Child Noun Types (16 months)				0.38*
	<i>Step 1</i>		0.01	-0.02	0.01	
		Mother Verb Types (16 months)				-0.11
Child Total Number of Words (16 months)	<i>Step 2</i>		0.42	0.38	0.41***	
		Mother Verb Types (16 months)				-0.25
		Child Verb Types (16 months)				0.65***

Note.

[†] 0.05 < *p* < 0.10;

* *p* 0.05;

*** *p* 0.01.

Table 4

Hierarchical regressions testing stability between child observational measures at 16 and 20 months and the CDI estimates at 24 months, after removing the contribution of maternal measures.

<i>Dependent Measure</i>	<i>Predictors</i>	<i>R²</i>	<i>AdjR²</i>	<i>R²</i>	<i>Final β</i>
Child CDI Vocabulary (24 months)	<i>Step 1</i>	0.10	0.07	0.10 [†]	
	Mother Number of Words (16 months)				0.32 [†]
	<i>Step 2</i>	0.32	0.27	0.22***	
	Mother Number of Words (16 months)				0.15
Child CDI Nouns (24 months)	<i>Step 1</i>	0.03	-0.00	0.03	
	Mother Noun Types (16 months)				0.18
	<i>Step 2</i>	0.27	0.22	0.24**	
	Mother Noun Types (16 months)				0.10
Child CDI Verbs (24 months)	<i>Step 1</i>	0.00	-0.04	0.00	
	Mother Verb Types (16 months)				0.03
	<i>Step 2</i>	0.26	0.21	0.26**	
	Mother Verb Types (16 months)				-0.09
Child CDI Vocabulary (24 months)	<i>Step 1</i>	0.13	0.10	0.13 [*]	
	Mother Number of Words (20 months)				0.37 [*]
	<i>Step 2</i>	0.58	0.55	0.45***	
	Mother Number of Words (20 months)				0.11
Child CDI Nouns (24 months)	<i>Step 1</i>	0.13	0.09	0.13	
	Mother Noun Types (20 months)				0.36 [*]
	<i>Step 2</i>	0.68	0.65	0.55***	
	Mother Noun Types (20 months)				0.18

<i>Dependent Measure</i>	<i>Predictors</i>	<i>R²</i>	<i>AdjR²</i>	<i>R²</i>	<i>Final β</i>
	Child Noun Types (20 months)				0.76***
Child CDI Verbs (24 months)	<i>Step 1</i>	0.02	−0.01	0.02	
	Mother Verb Types (20 months)				0.13
	<i>Step 2</i>	0.59	0.56	0.57***	
	Mother Verb Types (20 months)				0.01
	Child Verb Types (20 months)				0.77***

Note.

[†] 0.05 < *p* < 0.10;

* *p* 0.05;

*** *p* 0.01.

Table 5

Hierarchical regressions testing the stability of maternal measures between 16 and 20 months, after removing the contribution of child measures.

<i>Dependent Measure</i>	<i>Predictors</i>	<i>R²</i>	<i>AdjR²</i>	<i>R²</i>	<i>Final β</i>
Mother Total Number of Words (20 months)	<i>Step 1</i>	0.02	-0.01	0.02	
	Child Total Number of Words (16 months)				0.15
	<i>Step 2</i>	0.13	0.07	0.11	
	Child Total Number of Words (16 months)				0.05
Mother Noun Types (20 months)					0.35 [†]
	<i>Step 1</i>	0.09	0.06	0.09	
	Child Noun Types (16 months)				0.30
	<i>Step 2</i>	0.20	0.14	0.11 [†]	
Mother Nouns Initial Position (20 months)					0.24
	<i>Step 1</i>	0.03	-0.01	0.03	
	Child Noun Types (16 months)				0.18
	<i>Step 2</i>	0.21	0.15	0.18 [*]	
Mother Nouns Final Position (20 months)					0.07
	<i>Step 1</i>	0.00	-0.03	0.00	
	Child Noun Types (16 months)				0.01
	<i>Step 2</i>	0.15	0.09	0.15 [*]	
Mother Verbs Medial Position (20 months)					-0.05
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.00
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.01
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.34 [†]
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.34 [†]
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.34 [†]
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.34 [†]
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.34 [†]
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	
Mother Verbs Medial Position (16 months)					0.34 [†]
	<i>Step 1</i>	0.00	-0.04	0.00	
	Child Verb Types (16 months)				0.01
	<i>Step 2</i>	0.12	0.05	0.12 [†]	

d^* 0.05
;0.1:0> $d^*>0.5$
 d^*

Note

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Hierarchical regressions predicting child CDI scores at 24 months from mother measures at 16 months.

Table 6

<i>Dependent Measure</i>	<i>Predictors</i>	<i>R²</i>	<i>AdjR²</i>	<i>R²</i>	<i>Final β</i>
Child CDI Nouns (24 months)	<i>Step 1</i>	0.27	0.24	0.27**	
	Child Noun Types (16 months)				0.51**
	<i>Step 2</i>	0.50	0.44	0.23**	
	Child Noun Types (16 months)				0.35*
	Mother Nouns Initial Position (16 months)				0.38*
Child CDI Nouns (24 months)	Mother Nouns Final Position (16 months)				0.37*
	<i>Step 1</i>	0.65	0.63	0.65***	
	Child Noun Types (20 months)				0.81***
	<i>Step 2</i>	0.68	0.64	0.03*	
	Child Noun Types (20 months)				0.76***
Child CDI Verbs (24 months)	Mother Noun Types (20 months)				0.18
	Mother Nouns Final Position (20 months)				0.00
	<i>Step 1</i>	0.67	0.65	0.67***	
	Child Verb Types (20 months)				0.82***
	<i>Step 2</i>	0.73	0.68	0.06	
Child CDI Verbs (24 months)	Child Verb Types (20 months)				0.71***
	Mother Verbs Initial Position (20 months)				-0.21 [‡]
	Mother Verbs Central Position (20 months)				0.07
	Mother Isolated Verbs (20 months)				0.11

Note.

[‡] 0.05 < *p* < 0.10;
* *p* 0.05;
** *p* 0.01;
*** *p* 0.001.