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Qualitative aspects of productive vocabulary at the 200- and 500-word stages: A comparison between spontaneous speech and parental report data

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ABSTRACT

This paper compares the proportions of different word classes present in 30 Italian children at two specific stages of vocabulary development (200 and 500 words). The Italian version of the MacArthur Communicative Development Inventory and spontaneous speech samples produced during an observation session were both used to examine the extent to which these children produce quantitatively different vocabulary compositions. Both methods revealed a greater presence of nouns than other word classes in the sample studied, although significant differences were found in the noun/other word class proportions.

KEYWORDS

Language checklist; lexicon composition; methodological comparison; spontaneous speech; vocabulary development

INTRODUCTION

The study and identification of universal biases in early lexical learning is an important source of information for improving our understanding of initial conceptual and perceptual predispositions involved in the language acquisition process. A number of studies have documented the occurrence of recurring discrepancies in the order of appearance and frequency of different classes of words. A common finding is that content words form the basis of the one-word stage and first word combinations in the speech of the majority of children, while closed-class words and inflectional markers usually appear at a later stage. Moreover, it is now widely accepted that within the open-class category, nouns referring to objects are acquired before verbs and other content words, and constitute the predominant lexical category in the earliest stages of language development (Bates, Marchman, Thal, Fenson, et al., 1994; Caselli, Bates, Casadio, Fenson, et al., 1995; Dromi, 1987; Goldfield, 1993).

Recently however, the publication of new data collected in studies of Korean- and Mandarin-speaking children, which show that verbs and nouns are acquired contemporaneously (Choi & Gopnik, 1995; Tardif, 1996), has reopened the question of the existence of a universal noun bias in children's early productive vocabulary. This difference may be due to the type of methodology used; in fact, studies on children's early lexical development have been based, for the most part, on a variety of data derived either from maternal checklists or diaries or spontaneous production. Different measures of vocabulary composition have also been used to support the numerical importance of object words in children's early vocabularies. Although sometimes these different measures have been considered to be more or less equivalent, it is possible that different methods of data collection provide different measures concerning the relative and absolute proportions of particular word classes in children's early lexicons, even though the measures themselves can be correlated with each other to a great extent (Pine, Lieven & Rowland, 1996).

In this regard, some studies seem to suggest that there may be systematic quantitative differences between observational, diary and checklist measures of vocabulary composition. Bloom, Tinker & Margulis (1993), for example, maintain that observational measures tend to underestimate the proportion of common nouns in children's vocabularies compared with maternal reports. Pine (1992), too, found systematic quantitative differences between maternal diaries and observational measures of vocabulary composition due, at least in part, to a noun bias in maternal reporting and to differences in the likelihood of nouns and other lexical classes being produced during observational sessions. Tardif, Gelman & Xu (1999) supported this finding by showing that maternal reports of children's vocabulary knowledge on the CDI (MacArthur Communicative Development Inventory) are skewed to underestimating the proportion of verbs relative to nouns. Similarly, some authors have suggested that spontaneous speech samples are not an appropriate measure of children's vocabularies because they over-sample children's use of highly frequent vocabulary items, reflecting differences in the forms that children prefer to use rather than those that they are able to use (Au, Dapretto & Song, 1994; Caselli et al., 1995).

It is probable that parental checklists provide a more representative sample of language than can be obtained through spontaneous interaction in the laboratory

or at home, because they report words produced across all possible contexts and over a long period of time and are also less influenced by the word frequency variable. Further support for the effectiveness of parent reports is provided by studies which report moderately to highly significant correlations between vocabulary scores on parental checklists and both structured and naturalistic behavioural measures of language (Dale, 1991; Dale, Bates, Reznick & Morisset, 1989; Thal, O'Hanlon, Clemmons & Fralen, 1999).

On the other hand, as some authors have suggested, checklist data may be affected by both parental memory and inadequate training to recognize early linguistic forms (Dale, 1991; Dale et al., 1989). In addition, as mothers observe their children in a wide variety of contexts, they may pay more attention to their children's use of language in certain contexts rather than in others; thus, it is also possible that maternal reports are biased toward particular contexts.

Moreover, since not all words that children produce are necessarily included in the parental checklist, measures derived from this form of indirect observation must be considered as a smaller subset of children's productive vocabulary (Fenson, Dale, Reznick, Thal, et al., 1993); the proportion of words that parental reports underestimate could vary for different lexical classes. In this regard, Robinson & Mervis (1999) found that the checklist they used (CDI) did not capture all the lexical items found in a comprehensive diary listing and therefore it was better suited to assess lexical classes characterized by a lower number of items. Moreover, the uneven distribution of items from different lexical classes included in the CDI may lead to the size of some children's vocabularies being underestimated, especially in the case of children who learn a higher proportion of nouns.

Although parent-report measures potentially permit a more representative evaluation of children's language skills than is usually possible when working with restricted samples obtained during laboratory observation sessions, Fenson et al., (1993) indicated that, in the case of CDI, the educational level of parents in the norming samples exceeded national averages and that European/American parents were over-represented in their sample. In the light of these considerations they suggested caution in interpreting CDI data reported by parents with low educational levels. In fact, the CDI structure imposes multiple demands on parents to observe and judge various aspects of communication that are potentially susceptible to parent educational level bias.

Given the variety of outcomes reported, it is important to investigate the precise nature of the relationship between the checklist and other kinds of vocabulary composition measures and to clarify the nature of the information they provide. Only a very few studies have investigated this issue by comparing the effects of different kinds of measures in the same sample of participants. The results obtained by Pine et al., (1996) showed substantial and significant correlations between observational and checklist measures for both the percentage of common nouns and the percentage of frozen phrases at 50 and 100 words. Similar findings were obtained by Tardif et al., (1999) who compared the proportions of nouns and verbs in the early vocabularies of both English- and Mandarin-speaking children; their results showed that, regardless of the language spoken and the class of words being tested, maternal checklist data coincide with the particular words recorded in a given

observational period. However, the same authors also claimed that when measuring vocabulary from spontaneous speech samples only, consistent language differences were found in the proportion of nouns compared with verbs, replicating previous findings on the absence of a noun bias in the productive vocabulary of Mandarin-speaking children.

In this regard, some researchers have suggested that properties of the input language may account for the different order in which the various lexical categories emerge during the first stages of language acquisition. Gopnik & Choi (1990, 1995), for example, explained such differences by pointing out that Korean, unlike English, is an SOV (subject-object-verb) language in which subject and object are frequently omitted, so that verbs receive greater emphasis as they are often the only content word in sentences spoken to children. On the other hand, Tardif and colleagues (Tardif et al., 1999; Tardif, Shatz & Naigles, 1997) found that English-speaking caregivers emphasize nouns in preference to verbs by placing the former in the utterance-final position whereas Mandarin mothers tend both to produce more verbs than nouns and to place them in utterance-final position.

In Italian, however, in striking contrast to English, subjects are optional and frequently omitted, and so verbs constitute a high proportion of the content words to which Italian children are exposed. Moreover, deviations from SVO are rather common in Italian as all possible orders of subject, verb and object are acceptable in informal speech, particularly that addressed to young children. Overall, therefore, it can be said that verbs are very salient in Italian. This is borne out by Camaioni & Longobardi (2001) who found that mothers stress verbs more than nouns when speaking to their children, producing verb types and tokens more frequently than noun types and tokens and placing verbs in a salient utterance position more frequently than nouns.

This issue of the relationship between the checklist and other kinds of vocabulary composition measures should not be underestimated also because, at present, most information on vocabulary composition in Italian children, collected mainly through mothers' reports based on adaptations of the CDI, is quite contradictory. In fact, although there is a general consensus that verbs are outnumbered by common nouns at every point across the period between 50 and 200 words, some authors reported that verbs increase more sharply than nouns in the passage from 100 to 200 words. Moreover, the analyses based on individual differences have highlighted the fact that some children tend to acquire more nouns while others acquire more predicates, and that this differentiation is stable across the first 200 words (Caselli et al., 1995; D'Odorico, Carubbi, Salerni & Calvo, 2001). On the other hand, Camaioni & Longobardi (1995) claimed that only a limited proportion of the children they observed exhibited a clear predominance of general nominals (coded as referential) in their lexicon, whereas the great majority acquired a varied lexicon with a relative balance of referential and expressive styles.

This study presents an attempt to address the issue of methodology through a comparison of the words that children produced in an observation session with those reported by their mothers. It also examines the extent to which these different measures result in quantitatively different vocabulary composition scores, paying attention to possible differential biases.

METHOD

Participants

This study involved 30 Italian-speaking children (12 males and 18 females) whose families agreed to participate in a longitudinal study of language development. The participants were recruited from local birth records and all were resident in cities in the north of Italy. All children were healthy at the time of the study. Thirteen were first-born or only children, and 17 were later-born. The level of their mothers' educational attainment was equally distributed across three levels: level I (8 years of education) corresponding to junior high school; level II (13 years of education) corresponding to high school; level III (18 years of education) corresponding to graduate school.

Procedure

A trained interviewer visited the families at home to evaluate vocabulary development, which was done through the Italian version of the MacArthur Communicative Development Inventory (Primo Vocabolario del Bambino, PVB; Caselli & Casadio, 1995). The Italian version is modelled as closely as possible on the English version in terms of overall format, number and type of lexical categories and number of items. The PVB Infant form (Words and Gestures) was administered to infants up to 1;5 years of age, while the Toddler form (Words and Sentences) was administered from 1;6 years of age to the end of the study. The Italian Infant form contains: a section designed to assess the first signs of global understanding; a vocabulary list of 408 words, divided into 19 semantic categories, for which both comprehension and production is assessed; and a section focused on gestures and actions, which assesses intentional non-verbal communication, social interaction and representational skills. The Italian Toddler form consists of a vocabulary production checklist of 670 words, organized into 23 categories, and another two sections designed to assess morphological and syntactic development. In this work only the data for the vocabulary production checklist have been analysed.

When the first questionnaire was administered, the children ranged in age from 0;11.25 to 1;06.08. Data were collected on a monthly basis until the size of the children's vocabulary reached 200 words, when the age range was from 1;06.00 to 2;06.00 ($M = 1;11.10$). The language assessment was continued for a sub-group of 11 children until their vocabulary reached 500 words at a mean age of 2;01.03 (range 1;06.07–2;06.05).

When children were close to the 200- and 500-word vocabulary stages (200 words: vocabulary size mean = 215, range = 191–251; 500 words: vocabulary size mean = 522, range = 407–648), they were observed in the laboratory for a 30-minute video-recorded session of mother-child interaction with 6 different types of toys. The play materials were selected explicitly to create a noun-eliciting context (e.g., picture books) and to generate talk about the movements of the toys (e.g., mechanical toys) and the actions of those interacting with the toys (e.g., a female baby doll with a crib and a miniature baby bottle). At the beginning of the sessions an experimenter placed the

first toy on a small table in front of both the child and his/her mother who was asked to play with her child as she normally would at home. At intervals of 5–6 minutes the experimenter gave the child a new toy, following a fixed order, but leaving the previous toy with the child who was free to play as s/he liked. The experimenter did not interfere with mother-infant interactions, but responded to the child when addressed.

Coding and measures

The composition of the 200- and 500-word stages of the children's productive vocabulary, assessed by means of PVB, was analysed using the procedures outlined in Caselli & Casadio (1995). The following measures were calculated:

- the proportion of common nouns (excluding names of people, onomatopoeic words and routines);
- the proportion of verbs;
- the proportion of adjectives;
- the proportion of grammatical function words (pronouns, question words, prepositions, articles and quantifiers, conjunctions).

These proportions were arc sine transformed for statistical analysis.

Verbal productions recorded during the observation sessions (spontaneous production) were transcribed into CHAT format (CHILDES system; MacWhinney, 1991) by two independent observers. Cases of disagreement were reviewed by a third observer and resolved by viewing the video-recorded material. A list of the different word types used by each child was obtained using the *FREQ* program of the *CLAN* tool, and all repetitions of the mothers' words in each conversational turn were excluded from the total number of observed words. The remaining items included in the list were coded according to the same criteria used to classify the words checked in the PVB, and the same measures were then calculated.

RESULTS

Descriptive statistics for the checklist and the observational measures of vocabulary composition at the 200- and 500-word stages are presented in Table 1. Comparing the measures in this table, it can be seen that while estimates of the proportions of common nouns and adjectives in children's vocabularies appear higher when measured with the PVB as opposed to the spontaneous speech method, the opposite is true for the other lexical classes. The relationships between all the pairs of checklists and observational measures collected at both the 200- and the 500-word stage were investigated using Pearson product moment correlations and repeated measures analysis of covariance with methods of data collection (2) and lexical classes (4) as independent variables, and the total number of words produced in the observation session as a covariate.

The first of these analyses showed a total absence of correlation between the results of the two data collection methods at both the lexical stages examined. Thus, it would appear that the two measures do not correspond closely as far as individual differences in vocabulary composition are concerned. The covariance analysis

Table 1 Descriptive statistics (raw proportions) for checklist and observational measures of vocabulary composition at 200 and at 500 words

	<i>Mean proportion</i>	<i>SD</i>	<i>Range</i>
<i>At 200 words</i>			
Checklist measures			
Common nouns	0.582	0.060	0.480–0.726
Verbs	0.071	0.026	0.025–0.120
Adjectives	0.068	0.023	0.031–0.124
Function words	0.053	0.030	0.016–0.187
Others	0.222	0.030	0.179–0.290
Observational measures			
Common nouns	0.374	0.123	0.194–0.727
Verbs	0.092	0.039	0.029–0.206
Adjectives	0.051	0.029	0–0.117
Function words	0.136	0.055	0.022–0.280
Others	0.344	0.093	0.16–0.55
<i>At 500 words</i>			
Checklist measures			
Common nouns	0.551	0.049	0.47–0.65
Verbs	0.137	0.027	0.08–0.16
Adjectives	0.077	0.012	0.06–0.09
Function words	0.078	0.014	0.06–0.11
Others	0.154	0.007	0.14–0.16
Observational measures			
Common nouns	0.349	0.074	0.28–0.48
Verbs	0.142	0.049	0.06–0.21
Adjectives	0.067	0.039	0.01–0.14
Function words	0.190	0.044	0.13–0.28
Others	0.250	0.043	0.18–0.31

conducted at the 200-word stage indicated no effect of the covariate on the dependent variable ($F(1, 28) = 2.31, p = 0.14$). Both the main effects due to method ($F(1, 29) = 11.75, p < 0.01$) and lexical class ($F(3, 87) = 437.77, p < 0.001$), and their interaction ($F(3, 87) = 57.38, p < 0.001$) were statistically significant. Thus there is a substantial difference between one data collection method and the other in the overall proportions of the lexical classes considered, which are estimated as higher when measured by the PVB.

With regard the lexical class effect, the results obtained showed that, if the data collection method variable is not considered, the proportion of common nouns is significantly higher than those of other lexical classes (Bonferroni *post-hoc* analyses: $p < 0.001$) while the opposite was true for adjectives ($p < 0.01$). Indeed, no significant differences were found in the proportions of verbs and function words.

In order to verify if this trend is present in both methods of data collection, the simple effects of each method were considered. Data collected with the PVB were subjected to a Bonferroni *post-hoc* analysis; the results showed that the lexical items which appear most frequently in children's early productive vocabulary are common nouns ($p < 0.001$), whereas no significant differences were found in the proportions of verbs, adjectives and function words that mothers reported their children were able to use.

The distribution of common nouns in spontaneous verbal production collected during the observation sessions carried out at the same lexical stage was similar to that obtained with PVB; the children used more nouns than verbs, adjectives and function words ($p < 0.001$). Nevertheless, comparisons of the other lexical classes produced quite a different pattern. In fact, in spontaneous speech the children produced approximately twice as many verbs as adjectives ($p < 0.001$), and also produced more function words than either adjectives ($p < 0.001$) or verbs ($p < 0.01$).

In synthesis, the results showed that while nouns, independently of the data collection method used, constitute the most represented lexical class in the children's productive vocabulary, the distribution pattern of the other word types – including adjectives – obtained from both PVB and spontaneous language samples are quite different.

Moreover, when we examined the influence of method collection on the distribution pattern of the different lexical categories, the analysis of variance revealed that the estimated proportion of common nouns ($F(1, 29) = 80.34, p < 0.001$) and adjectives ($F(1, 29) = 9.99, p < 0.01$) was higher when the checklist method was used; on the contrary, data derived from spontaneous language samples showed significantly higher proportions of both verbs ($F(1, 29) = 5.98, p < 0.05$) and function words ($F(1, 29) = 64.95, p < 0.001$). Taken together, these findings suggest that different methods of data collection can affect the proportional scores.

The analysis conducted at the 500-word stage also showed that the effect of the total number of words produced in the observation session as a covariate is not statistically significant ($F(1, 9) = 0.14, p = 0.71$). Moreover, as in the previous lexical stage, a main effect of both method ($F(1, 10) = 5.63, p < 0.05$) and lexical class ($F(3, 30) = 179.83, p < 0.001$) and an interaction effect between lexical class and method of data collection ($F(3, 30) = 41.84, p = 0.001$) were found.

With regard the main effects of method of data collection and lexical class, the trend that emerged is similar to that obtained at the 200-word stage. PVB provides a total proportion of items classified into the four lexical classes which is higher than that obtained from spontaneous speech samples. Moreover, the proportion of common nouns is significantly higher than those of the other word types (Bonferroni *post-hoc*: $p < 0.001$), while the proportion of adjectives remains the lowest ($p < 0.001$); comparisons between the proportions of verbs and function words are, instead, not statistically significant.

The Bonferroni *post-hoc* analyses carried out for both data collection methods confirmed this trend only for data derived from spontaneous speech samples. The PVB results, on the other hand, indicated that the common nouns are the lexical items most frequently reported by mothers ($p < 0.001$), followed by verbs, which are used more often than adjectives ($p < 0.001$) and function words ($p < 0.001$);

moreover, no significant differences were found in the proportions of adjectives and function words checked off in the PVB.

Multiple comparisons carried out between all the pairs of observational and checklist measures obtained for each lexical class showed statistically significant differences for common nouns and function words; in detail, the checklist scores showed higher estimates for the proportion of nouns (Bonferroni *post-hoc*: $p < 0.001$) and significantly lower estimates for grammatical function words (Bonferroni *post-hoc*: $p < 0.001$) in the children's early vocabularies.

DISCUSSION

The primary aim of the present study was to analyse vocabulary composition by using multiple measures to verify noun predominance in the early phases of Italian language acquisition. The correspondence between observational and checklist measures of vocabulary composition was also investigated by examining the extent to which such measures correlate with each other and the extent to which they result in quantitatively different vocabulary composition scores.

With regard to the question of vocabulary composition, the results show that nouns representing concrete objects and events predominate over other lexical classes independently both of the data collection method used and the vocabulary size considered. In fact, although the scores obtained from the two measures differed, nouns appear with the highest frequency, representing more than 50% of children's vocabulary in the maternal reports and approximately 35% in the spontaneous speech in each stage of vocabulary development examined.

It can therefore be claimed that this study provides an additional contribution to the hypothesis that children exhibit a 'noun bias' in the early stages of the lexical acquisition process. According to several authors who have analysed the composition of children's early lexicons in various languages (Bassano, Maillachon & Eme, 1998; Bates et al., 1994; Caselli et al., 1995; Jackson-Maldonado, Thal, Marchman, Bates & Gutierrez-Clellen, 1993), data concerning the developmental stages considered seem to reflect an emphasis on referential rather than on predicative devices. As Genter (1982) and Markman (1987) suggested, there could be pre-existing and possibly innate constraints which guide children in the encoding process of meanings and which make nouns more accessible than verbs and other predicates. Such constraints lead children to assume initially that all words refer to whole objects and not to any of their parts or to the actions or relations in which the object participates, thus favouring the acquisition of nouns over other lexical classes. Moreover, as nouns classify objects into natural categories, they form cohesive perceptual entities that usually refer to whole objects which children have already perceptually isolated from the environment.

The data on vocabulary composition highlight a general acquisition trend that confirms the theoretical arguments advanced in favour of a universal noun-verb sequence. On the other hand, it seems that the occurrence of verbs significantly increases in the passage from 200 to 500 words, becoming more frequent than adjectives and function words, especially in the case of checklist measures.

D'Odorico et al., (2001) have previously observed a similar trend in Italian children's vocabulary development. These authors found that, when using mothers' reports to assess children's vocabulary instead of recordings of free speech, after the first 100 words predicates showed a significantly higher rate of occurrence than nouns.

Turning to the consistency and the relative biases of observational and checklist measures, the results obtained from this study regarding both nouns and verbs observed at the 200-word stage do not correspond to the findings reported by authors who, having made a similar comparison, found the two types of measures to be highly correlated, despite the presence of a substantial variation (Pine et al., 1996; Tardif et al., 1999). This discrepancy may be attributed principally to substantial methodological variables such as the context in which the children's spontaneous language was sampled, the duration and structural conduct of the observation sessions and, in certain cases, in part also to the types of the toy chosen. Such methodological conditions, in fact, could have resulted in a reduced production of certain items of specific lexical classes and to a contextual increase in the frequency of other word categories. In point of fact, context effects have been found for certain aspects of children's speech such as differences in speech acts due to play activity (Lucariello & Nelson, 1986; Tardif et al., 1999), although most of the studies involved in the noun bias debate did not vary context systematically. Moreover, given comparable methods of assessment, it is important not to underestimate the fact that the above-mentioned studies involve languages other than Italian; crosslinguistic research has provided evidence that the composition of children's vocabularies differs by language and setting and may reflect culture-specific emphases (Bornstein & Cote, 2005).

The main effect due to the data collection method found in this study seems to support the hypothesis that parental-report measures, evaluating children's language competence through multiple observations over an extended period of time, may provide a more comprehensive and representative appraisal than is usually possible from brief samples obtained in the laboratory. Nevertheless, the absence of correlation across different measures, as well as the systematic quantitative differences found for each lexical category between the scores generated by the two methods analysed, would indicate that this particular outcome pattern could be due not only to the inadequacy of the measures based on spontaneous speech but also to a combination of checklist and observational sampling biases.

This study, in fact, seems to provide support for the hypothesis that checklist measures of vocabulary composition may actually accentuate the noun bias in the first lexicon, whereas grammatical function words are particularly overestimated when the data referred to are obtained from the analysis of children's spontaneous speech. Even so, the finding reported by some authors (Pine, 1992; Tardif et al., 1999) to the effect that maternal reporting is more focused on nouns than on other parts of speech, and that it tends to underestimate the proportion of verbs relative to nouns, is only partially supported by the data from this study. In fact, while significant differences were found between these two lexical categories with respect to the proportion of words obtained by means of the PVB rather than spontaneous speech samples at the early vocabulary stage considered (200 words), particular attention has to be paid to the absence of systematic quantitative differences between the

same scores derived from the two data collection methods at the 500-word stage. If different kinds of measure do generate different information about the distribution of common nouns and verbs in productive vocabulary, it can also be assumed that such kinds of quantitative differences tend to be cancelled out when the vocabulary size becomes wider.

To summarize, although this study seems to be in line with previous research indicating the presence of underlying cognitive factors that support the acquisition of common nouns before other word types, the results also emphasize that the degree of accuracy of direct and indirect observation methods can vary with respect to the different lexical items which constitute children's early productive vocabularies. Consequently, it is possible that different kinds of measure will also supply different answers to the issue of vocabulary composition in general. In this respect, this study seems to suggest that there are no reasons for favouring one particular measure since both may be inadequate for certain aspects, at least when the vocabulary is still limited.

As Pine et al. (1996) have suggested, the implication is that neither observational measures nor maternal reports used alone are ideal means of estimating the absolute proportions of different lexical items in children's productive vocabularies. This issue is probably best addressed by studies which collect more comprehensive vocabulary records combining information from maternal report and observational measures.

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