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Lexical Development in Bilingual Infants and Toddlers: Comparison to Monolingual Norms

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This study compares lexical development in a sample of 25 simultaneous bilingual and 35 monolingual children for whom semilongitudinal data were collected between the ages of 8 and 30 months. A standardized parent report form, the MacArthur Communicative Development Inventory (1989), was used to assess the children's receptive and productive vocabulary in English and/or Spanish. A methodology was devised to assess the degree of overlap between the bilingual children's lexical knowledge in one language and their knowledge in the other. Using the measures presented here, there was no statistical basis for concluding that the bilingual children were slower to develop early vocabulary than was

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the monolingual comparison group. The wide range of vocabulary sizes observed at these ages in normally developing children (Fenson et al., 1991) was observed in these bilingual children as well. The close correspondence of the pattern of the bilinguals' growth in two languages at once to monolinguals' growth in one suggests that norms for lexical development in bilinguals should be made with reference to the children's performance *in two languages* together.

A knowledge of the advantages and disadvantages of bilingualism is of growing interest as the number of households in the United States in which more than one language is spoken continues to rise (Veltman, 1988). Despite scanty and at times contradictory evidence, the view that bilingualism is a risk factor in development seems to prevail. Anecdotal evidence suggesting that bilinguals develop language more slowly than do monolinguals is common, but the issue is far from resolved. We know of no controlled studies of large groups of children that show slow language-learning in bilinguals (Hakuta, 1986). Few studies have compared children learning one language with those learning two, especially at early ages. The research reported here compares bilingual and monolingual lexical development, as measured by the relative vocabulary sizes of very young simultaneous bilingual children and monolingual age-mates. A primary motive is to establish guidelines for identifying lexical delay in bilingual babies and toddlers.

Investigating lexical delay is particularly important, as several recent studies have confirmed that children with delayed language at 24 to 30 months are at risk for persisting difficulties (Dale, 1991). For example, Fischel, Whitehurst, Caulfield and DeBaryshe (1989) found that 65% of toddlers who were at least 2.5 standard deviations below the mean on the Expressive One-Word Picture Vocabulary Test remained delayed 5 months later. In another study, Rescorla (1989) identified 15 boys with specific expressive language delay at 24 to 30 months and found that at age 3 to 4 years 53% were still significantly delayed. Thus, a substantial proportion

of late-talkers may not catch up, making it important to clarify factors that contribute to early language delay.

However, determining what constitutes "delay" in a bilingual child is not straightforward. There is no clearly appropriate measure of young bilingual children's language capabilities (American Psychological Association, 1985; Figueroa, 1990). No standardized measures are referenced to bilinguals directly, and single-language comparisons to monolinguals are problematic. Comparing performance in only one language at a time neglects the totality of the bilingual's abilities, especially the knowledge specific to the untested language. To sum measures in the two languages fails to correct for abilities, if any, that the child shares between the languages. Furthermore, there is no firm theoretical basis for choosing one comparison over another (Paivio & DesRochers, 1980; Hamers & Blanc, 1988).

The literature on early bilingual acquisition depends heavily on the case study method, a form in which systematic comparisons with other children are not generally attempted (McLaughlin, 1984; De Houwer, 1990). Group studies of older children have produced conflicting results. Some studies have found areas in which bilingualism seems advantageous. For example, research comparing the cognitive abilities of bilingual school-age children with those of monolinguals has shown that bilingual children may have greater adeptness at divergent and creative thinking, earlier and greater awareness of the arbitrary nature of word-meaning pairings, and greater linguistic creativity. Other studies show no difference or else disadvantage for bilinguals. (See Hakuta, 1986; Saunders, 1988; Hamers & Blanc, 1988 for reviews of this literature.)

Studies have generally reported negative effects of bilingualism on lexical measures. Several researchers have found that bilingual children show lower levels of receptive vocabulary than do their monolingual peers. Ben-Zeev (1977), for example, controlling for IQ, showed a 10-point deficit on the Peabody Picture Vocabulary Test (PPVT) for Hebrew-English bilingual 7-year-olds. Rosenblum and Pinker (1983) found bilingual 5-year-olds

scored, on average, 26 points lower on the PPVT than did their monolingual counterparts, and Doyle, Champagne, and Segalowitz (1978) reported a similar disadvantage in French-English bilingual preschoolers. Umbel, Pearson, Fernández, and Oller (1992) found that bilingual first-graders matched for socioeconomic status were behind age-mates in English vocabulary and near, but slightly below, the mean on the Test de Vocabulario en Imagenes Peabody (TVIP), the Spanish version of the same test. A similar pattern on the PPVT and TVIP was found in English-Spanish bilingual preschoolers by Fernández, Pearson, Umbel, Oller, and Molinet-Molina (1992). These studies, which investigated bilingual children's vocabulary knowledge of both languages, have raised questions about the appropriateness of using monolingual vocabulary norms to evaluate bilinguals.

There is even less research on productive vocabulary development in younger, simultaneous-bilingual infants and toddlers. The only published records of lexical acquisition are from linguists who have studied their own children's development (Leopold, 1949; Volterra & Taeschner, 1978; Vihman, 1985; Saunders, 1988). (For reviews see McLaughlin, 1984; De Houwer, 1990.) Whereas their descriptions do not deal with norms, Volterra and Taeschner's (1978) widely cited claims, based on Taeschner's own children and Leopold's, highlight the lack of overlap in the lexicons of the children's two languages and therefore demonstrate the necessity of examining both the languages of a developing bilingual.

These authors have not generally noted bilingual lexical delay, but their subjects are not considered typical. No studies of groups of infants have been reported. Perhaps the paucity of work derives from the fact that until recently there were no standardized lexical measures for infants in even one language (Dale, Bates, Reznick, & Morisett, 1989; Rescorla, 1989; Fenson et al., 1991). Now that such lexical measures are becoming available, there is still no standard form for measuring lexical knowledge in two languages at once.

This study adds to our knowledge of bilinguals' early vocabulary knowledge by reporting on lexical development, both

receptive and productive, in a sample of 25 English-Spanish bilingual children for whom semilongitudinal data were available from 8 to 30 months. Data from an average of 9 bilingual children at each of 6 age groups were obtained using a standard instrument in English and Spanish that allows comparison to a norming sample as well as to other groups of infants. In addition, we outline a balanced approach to assessing children's vocabulary in two languages. We both describe a system to document the degree of overlap between the children's lexical knowledge in one language and their knowledge in the other and explore how such information could be used to make meaningful comparisons among bilinguals and between bilinguals and monolinguals.

The major questions to be answered are (a) In what ways can the vocabularies of bilingual and monolingual children be meaningfully compared, (b) What can such comparisons tell us about the nature of vocabulary acquisition in general, and (c)What evidence can be brought to bear on the claim that early bilingualism hinders vocabulary acquisition? This paper differs from previous work on lexical development from first words to 30 months of age in that it (a) uses a recently standardized vocabulary measure in English, with an adaptation in Spanish; (b) proposes a variety of measures for assessing the bilingual lexicons; and (c) provides data on more subjects than previous studies have.

METHOD

SUBJECTS

The subjects were selected from those recruited for a larger longitudinal study on vocal development. Twenty-five children being reared in English-Spanish bilingual homes (9 females & 16 males) and 35 children being reared in monolingual homes (14 females & 21 males) were used as the sample for the present study. The data on them were those collected for the larger study. However, the goals of the larger study were not identical to those

of the present research, so the same data had not been consistently collected for all the children. The number of observations on file ranged from 1 to 7 per child, made at approximately 2- to 3-month intervals. The age ranges evaluated were for the bilingual children, 8 to 30 months with a mean of 20.6 months; and for the monolinguals, 9 to 30 months with an average age at observation of 21.9 months. The average socioeconomic status of the bilingual children's families, as determined from a modified Hollingshead scale (1 to 5, 1 high), was 2.2 whereas the monolingual's average socioeconomic status score was 2.5. The children were all of normal intelligence; the average Bayley (1969) score at 18 months of the bilingual group was 112 (SD=11.4) and the monolingual group was 110 (SD=12.7). Four bilingual and 8 monolingual children were approximately 5 weeks premature with no other health problems. Thirty-two of the monolinguals were from English-speaking homes; 3 were from Spanish-speaking homes.

All of the bilingual subjects had significant exposure on a regular basis to both English and Spanish through their various caretakers, who are native speakers of one or the other or both languages. Although all parents of bilinguals expressed a desire to provide an environment equally balanced between the languages, and the conditions of their households appeared to support that desire, only 4 of the children appear to have had equal exposure to both languages. Parent estimates of language exposure, updated at regular intervals, averaged between 60–65% of one language and 35–40% of the other; 11% had an exposure less balanced than 75:25. Spanish predominated for slightly over half (13:25) of the children. Fourteen of the 21 children observed more than once experienced a relatively consistent language environment throughout the data collection period, whereas 7 children experienced changes in the percentage of time they were exposed to each language, including changes in the predominant language.

MATERIALS

Normed parent report instruments, the MacArthur Communicative Development Inventory (CDI) Toddler and Infant forms (1989) and their Spanish adaptations, the Toddler and Infant Inventario del Desarrollo de las Habilidades Comunicativas (Jackson-Maldonado & Bates, 1988), were used to assess the subjects' vocabulary sizes. The Infant English form, used to assess words frequently produced and understood by infants between 8 and 15 months of age, contains 395 words arranged in 22 semantic categories. The Toddler English form, for use with children between 15 and 30 months, contains 679 words. Instructions on the Toddler form tell the parents to mark the words that their child spontaneously produces whereas the Infant form instructs parents to mark words their child produces and comprehends as well as words only comprehended. The vocabulary scores for Infants are the number of words marked by the parent, one number for comprehension, another for production; for Toddlers, only production is tallied. Percentile norms for girls and boys, based on CDIs from 1,600 children, are available at one-month intervals, comprehension up to 16 months, production up to 30 months.

The Spanish version of the CDI has 428 words on the Infant form and 732 words on the Toddler form. It was developed by adopting the format of the English (and Italian and Japanese) Inventories, but using Spanish word-lists and research studies to dictate the items included. The version of the Spanish CDI used in our study was modified slightly to reflect lexical items used by the Cuban and Cuban-American population of Miami (Fernández & Umbel, 1991). Median values for the Spanish CDI, calculated on a sample of 328 monolingual Spanish children (Jackson-Maldonado, Marchman, Thal, Bates, & Gutierrez-Clellen, 1991) provide a rough standard of comparison for the Spanish vocabulary scores.

The CDI is more appealing than previous parent report measures because it relies on recognition rather than recall in assessing vocabulary size. Additionally, the two forms of this inventory focus on "emerging behaviors" at times when these behaviors are current (not retrospective) and limited in number. Its upper boundary at 30 months reflects the fact that most typically developing children know so many words at that age that

parents can no longer keep track of them. After 30 months, other assessment instruments are more appropriate.

Evidence of the CDI's reliability and validity is reported in Fenson et al. (1991). The CDI has shown high internal consistency, producing Cronbach's alpha values of .95 for Infant Comprehension and .96 for Infant and Toddler Production. Test-retest reliability is also high yielding Pearson coefficient values in the .8 to.9 range for Infant Comprehension and Production and values exceeding .9 for Toddler Production (Fenson et al., 1991). In addition to demonstrating high reliability, the CDI has shown high concurrent and predictive validity (Dale et al., 1989; Dale, 1991). Dale tests concurrent validity correlations between CDI expressive vocabulary and performance on the Expressive One-Word Picture Vocabulary Test (EOWPVT), the Index of Productive Syntax (IPSyn), and information obtained from language samples. Correlations to lexical and syntactic measures ranged between .68 and .78, $p<.01$; to the number of types (different words) in a 100-utterance sample, .74; to the IPSyn, .78; to the EOWPVT raw scores, .73; and to Mean Length of Utterance, .68. Similar correlations for our sample for measures from 24-month laboratory samples to 2-year CDI production percentiles yielded the following values: to number of types in a 50-utterance sample, $r(29)=.66$, $p<.001$; and to the PPVT-R (Dunn & Dunn, 1981) at 30 months, $r(20)=.77$, $p<.001$.

Additionally, vocabulary scores from 228 children tested at two different times (Time 1 at 16–24 months, Time 2 at 22–30 months) were correlated at .71 ($p<.0001$), indicating relatively high stability, but allowing for differential growth over that period. Throughout the age range measured by the CDI/Toddler, correlations between successive ages are substantial and reasonably stable (Fenson et al., 1991). The CDI vocabulary list for a given child is close to being a true inventory; however, to the extent that the form does not exhaust the list of possible words children might say, it—like vocabulary tests at later ages—requires an extrapolation of the total vocabulary based on a controlled sample.

PROCEDURE

The children's parents filled out a language background questionnaire that they updated each time they filled out the CDIs. In instructing the parents, we emphasized that these were measures of spontaneous vocabulary production rather than prompted repetition. The strict emphasis on marking only spontaneously-produced words may have made the instructions given to the parents in this study, more conservative than those given to the parents of the children in the norming sample, but all other procedures were standard (L. Fenson, personal communication, 8 May 1992). As indicated in the CDI instructions, the parents were told to mark words that their child said, even if the pronunciation was incorrect. Thus the consistent pairing of a certain sound with a particular meaning was sufficient for the parents to mark that word, even if their child's production of the word was very different from the adult pronunciation. Word-forms that were used for more than one concept within a language, such as *ba* for *ball* and *ba* for *baby* were counted separately because they reflected two sound-meaning pairings.

We should caution that the information provided by the CDI is approximate in that, although the words on the form are grouped by semantic category to aid recall, the parent is not asked to specify the referent of a word, or even to indicate whether the word is used referentially. At these ages, children's meanings for words are often either overextended or underextended, as compared to the adult definition. *Ball*, for example, may overextend to *anything round* or *anything one throws*, whereas a word like *zapatos* may underextend to refer only to one particular pair of sandals. No claims are made in the use of the CDI that the children's words have identical meanings to adults', just that the children have begun to use them meaningfully. This caution applies to both monolinguals and bilinguals.

The vocabulary size of the monolingual children was determined by counting the number of words that the parents had checked off on the form at a given age. This score, referred to as

English or Spanish vocabulary, corresponds to the number of sound-meaning pairings the child has made at the given age, which for monolinguals is also a rough measure of the number of concepts for which the child has a lexical representation. To determine how the children's lexicons compared in size to those of other children of the same age and sex, percentile scores were obtained based on norms for the English CDI (Fenson et al., 1991). In arriving at the percentile scores for premature subjects, corrected ages were used.

To analyze the vocabulary size of the bilingual subjects, four measures were taken: two measures (English and Spanish Vocabulary) were taken directly from the respective CDIs; and two double-language measures (Total Vocabulary and Total Conceptual Vocabulary) were constructed from the comparison of the single-language forms. The first two, the single-language measures, were like the monolingual measures except that each bilingual subject had two "monolingual" assessments. The two double-language measures encompassed the bilingual child's abilities in both languages summed together and then corrected for knowledge shared between them. Unlike the monolingual child for whom the number of sound-meaning pairings (Total Vocabulary) and lexicalized concepts (Total Conceptual Vocabulary) is roughly equal to the number of words, in the bilingual child it is more difficult to assess overall knowledge of words and concepts. To the extent that words may be coded in one *or* both languages, the number of sound-meaning pairings is generally higher than is the number of concepts with lexical representations. To compute the double-language measures, it is necessary to determine how many words a child has coded in only one language and how many are coded in both.

For this study, to know when a word checked on the form for one language was similarly checked on the other, one form had to be mapped onto the other to the extent possible (Pearson, 1992). The first step in the mapping process was to compare the English and Spanish versions of the CDI and determine which words could be termed Translation Equivalents, or *doublets*. For the most part,

this was fairly straightforward. The English and Spanish words in each pair were both assigned a *pair number*. For instance, *dog* and *perro* were both given the number 214, *table* and *mesa* were assigned number 927, and so forth. However, due to cultural and linguistic differences between Spanish and English and, in some cases, simple gaps on one form or the other, not all words could be paired. About 80% of the words could be matched with a translation equivalent on the other form. In the children examined here, unpaired words rarely made up more than 15% of a child's vocabulary; therefore, we could conduct an analysis of translation equivalents on at least 85% of each child's reported vocabulary.

In most cases, translation equivalents represent two sound-meaning pairings for one lexical concept, but some of the paired words are phonetically similar in the two languages, especially in baby talk. These words, such as *mama* and *choo choo*, are not clearly distinguishable as either English or Spanish. Because a child who says *choo choo* in English and *choo choo* in Spanish essentially has only one sound-meaning pairing, we counted phonetically-similar doublets such as these only once in arriving at a child's Total Vocabulary. In other words, a child's Total Vocabulary was calculated by summing all the English words the parent had checked off on the English CDI and all the Spanish words checked off on the Spanish CDI, then subtracting the number of phonetically-similar doublets, so they were counted only once in the tally.

Another measure, the Total Conceptual Vocabulary measure was designed to take account of the number of concepts lexicalized by the child, whether the words were coded in one or both languages. In effect, the measure includes all the words in one language plus the singlets of the other language (i.e., all the words from the other language that represent concepts or linguistic functions not lexicalized in the first language). Thus, a single concept known by different labels in English and Spanish was counted only once in the Total Conceptual Vocabulary (as opposed to Total Vocabulary). Calculating Total Conceptual Vocabulary in this manner, cross-language synonyms (e.g., *dog* and *perro*) were counted once whereas

within-language synonyms (e.g., *hi* and *hello*) were counted twice, just as they were in the monolingual vocabulary size calculation.

We compared these four measures of vocabulary size—English, Spanish, Total, and Total Conceptual—to norms for monolingual English children (Fenson et al., 1991) to determine how the bilingual children's vocabulary sizes compared to those of monolingual children of the same age and sex. (Preliminary figures from Jackson-Maldonado et al., 1991, indicate that Spanish monolingual children's vocabulary sizes, as measured by the Spanish CDI, are roughly equal to those of their English monolingual counterparts throughout the age range in question. However, complete Spanish norms are not currently available, so percentiles were derived from the tables for the English form.) Similarly, the double-language scores were compared to the monolingual English norms to derive percentile scores. As the double-language measures have no normative baselines, the percentiles derived were for purposes of illustration and comparison only.

For each child at each age, a number-of-words score was associated with a percentile score. To compare the average performance of bilingual and monolingual subjects over different time points, global mean percentiles were calculated for the percentile scores associated with each of the four measures of vocabulary for the bilingual subjects and with English (or Spanish) Vocabulary for the monolinguals. In calculating the average percentiles in production and comprehension for those children observed more than once, we first calculated a mean percentile value from different ages. We then averaged the individual means to arrive at the global mean percentile by language group for each of the measures of vocabulary, treating comprehension and production separately.

Comprehension was measured between 8 and 16 months. The production figures were taken from observations between 14 and 30 months. For the analyses, only production data after 14 months were used, because more data were available for both language groups after that point and because most children had

enough words—about 10 in Production and 100 in Comprehension—that small increments in the number of words known produced less drastic differences in percentile scores.

However, combining all the bilingual children's English and Spanish scores yielded a potentially confusing average in each language for this group, because some of the bilinguals were English-dominant whereas others were Spanish-dominant. Therefore, we calculated the single-language percentile scores separately for English-dominant and Spanish-dominant children. Especially important, this prevented making single-language normative comparisons without knowing whether the comparison was to the children's dominant or nondominant language. The language-dominance assignment was based on the language in which the child had more words. All time points for which data were available were examined in determining the higher-scoring language. When the child had more words in one language at one time point and more words in the other at another observation, we could not determine language dominance and these children's data were not considered in the single-language measures. There were two such cases for comprehension and four for production.

Global mean percentiles, covering all the ages, for production and comprehension in the monolinguals versus the bilinguals were compared statistically. Because the double-language measures, Total Vocabulary and Total Conceptual Vocabulary, counted all production—in dominant and nondominant languages—the dominance differences were not an issue. For these measures, the bilingual subgroups could be treated together, and the comparison to monolinguals was statistically tested. For the single-language measures, only the Spanish-dominant children's Spanish and the English-dominant children's English were compared statistically to the monolingual children's measures.

RESULTS

Figure 1 compares the mean production measures of the

bilingual and monolingual children by depicting the global mean percentiles collapsed across time for the measures described above. Because the single-language measures in Figure 1 do not differentiate between children whose dominant language was English versus those who were Spanish-dominant, single-language

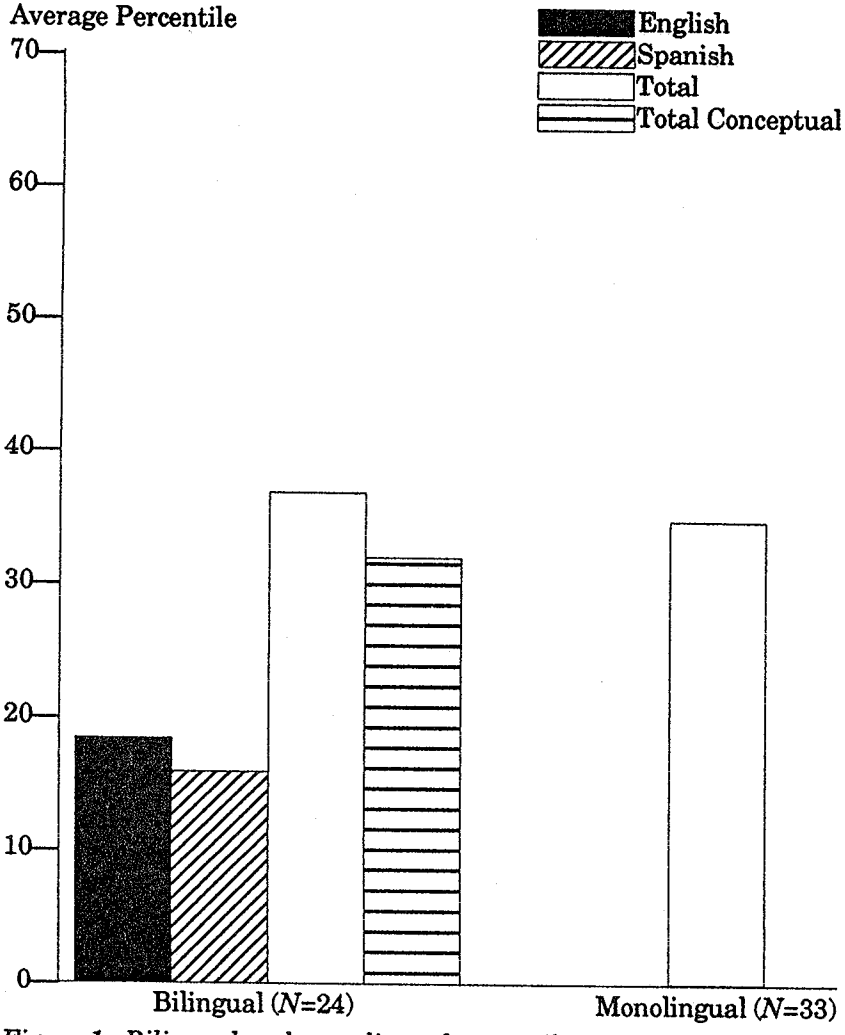


Figure 1. Bilingual and monolingual percentiles averaged across ages (Production)

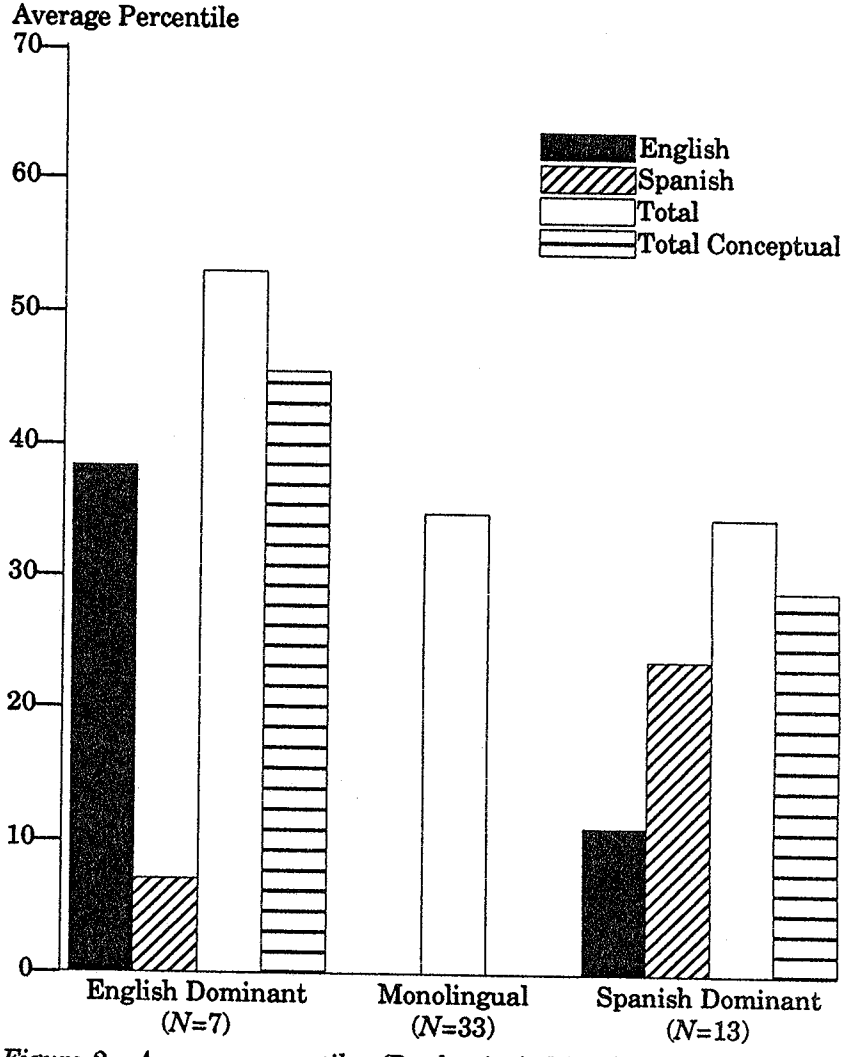


Figure 2. Average percentiles (Production): Monolinguals compared with bilinguals by dominant language group

comparisons were not analyzed statistically for the whole bilingual group together. Figure 2 compares average percentiles for production, with the bilingual group split according to language dominance.

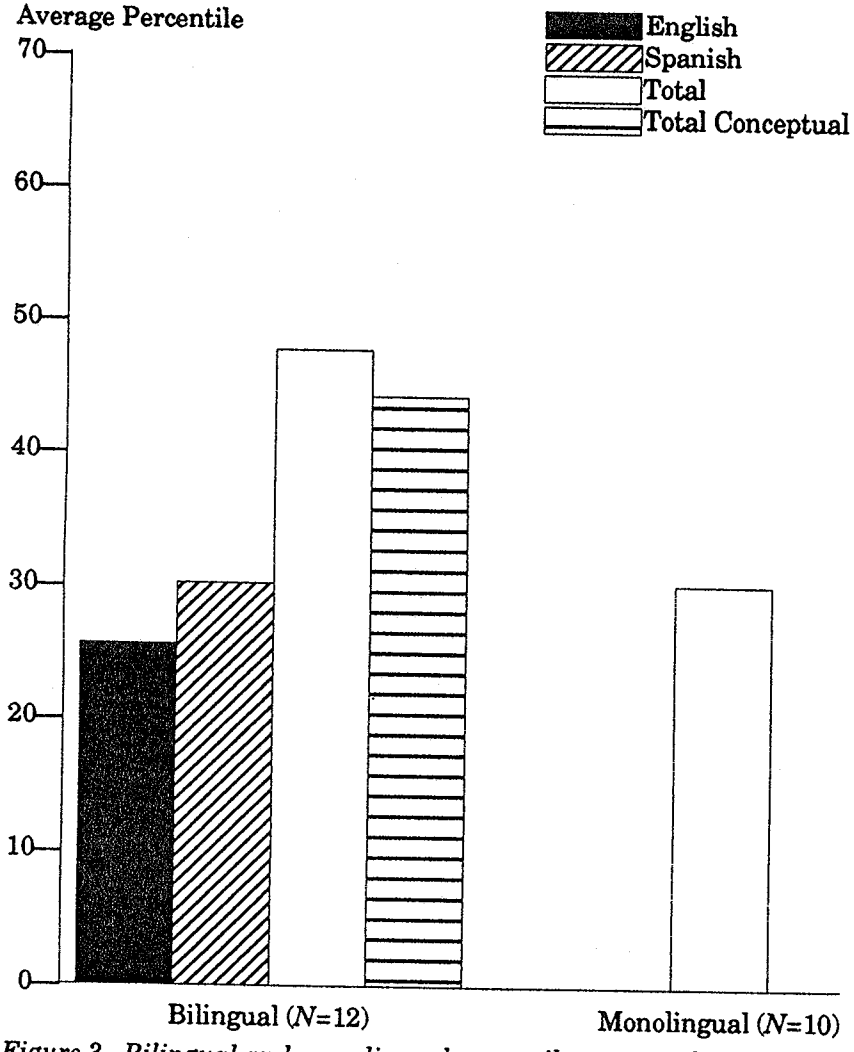


Figure 3. Bilingual and monolingual percentiles averaged across ages (Comprehension)

Because the double-language measures take into account both the dominant and nondominant language, the data were analyzed for the whole bilingual group together. For production, the bilingual group's double-language measures were very close to the monolingual children's average, (BL M=36.9, SD=29.8 and ML

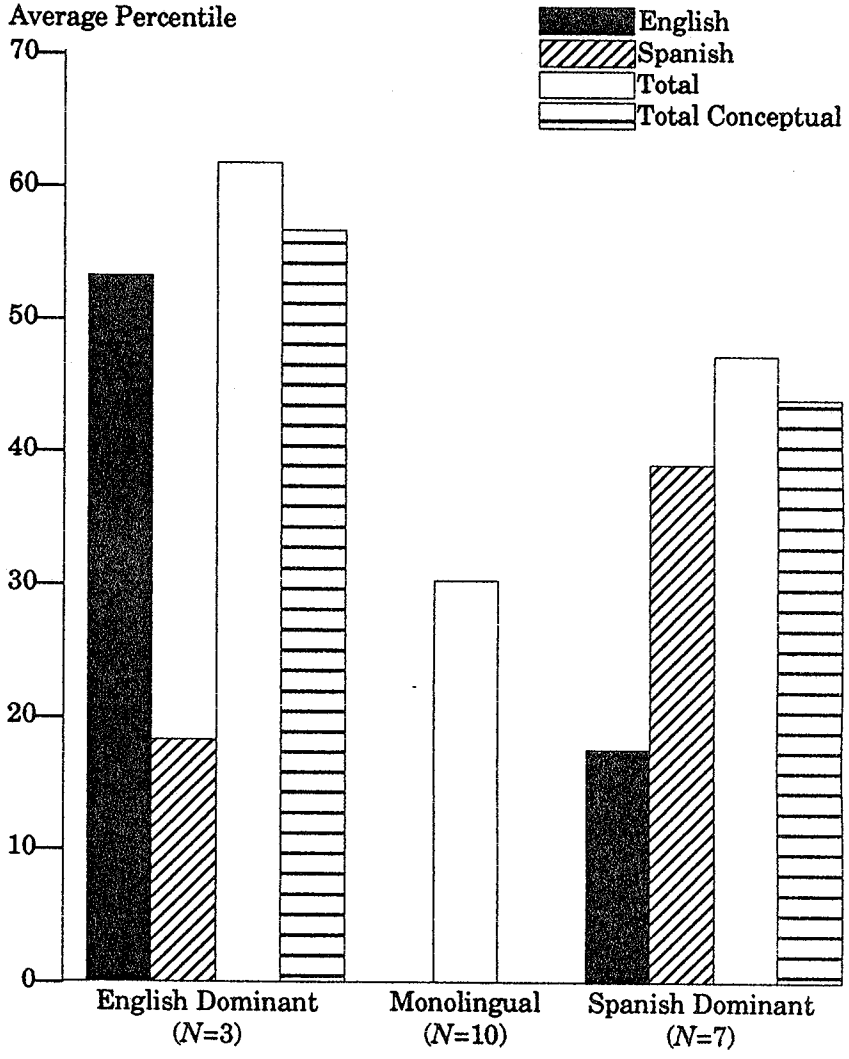
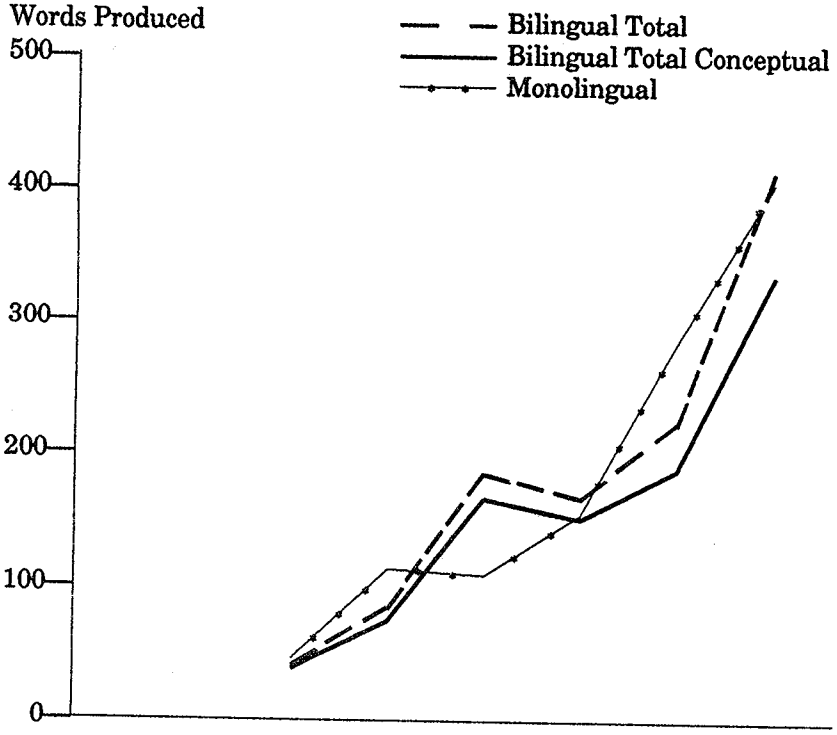


Figure 4. Average percentiles (Comprehension): Monolinguals compared with bilinguals by dominant language group

M=34.,8 SD=26.2, t(51)=–1.04, *ns* for bilingual Total Vocabulary; BL M=32.1, SD=25.6 vs. ML M=34.8, t(51)=–.34, *ns* for Total Conceptual Vocabulary).

Figure 2 reveals that in production the English-dominant children, except in the case of their weaker language, Spanish,

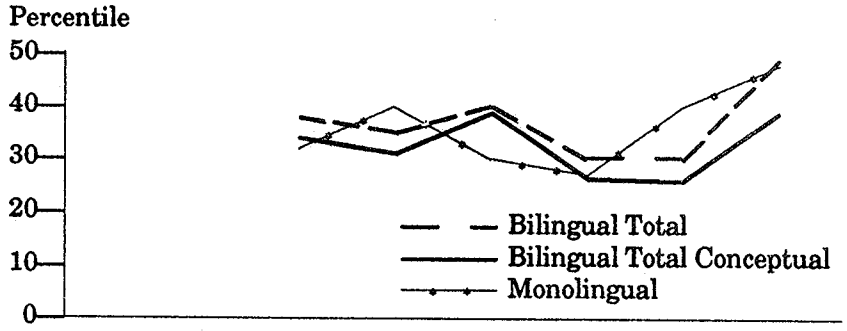


Bilingual *N*	9	12	8	7	8	9
Monolingual *N*	8	10	20	21	17	15

Figure 5. Bilingual and monolingual production

Table 1
Descriptive Statistics for Bilingual and Monolingual Production

	Bilingual					Monolingual		
	Total			Total Conceptual				
Ages	*N*	*M*	*SD*	*M*	*SD*	*N*	*M*	*SD*
16–17 months	9	42	32	39	31	8	44	35
18–19 months	12	82	66	73	59	10	113	103
20–21 months	8	186	135	168	118	20	109	71
22–23 months	7	168	151	154	141	21	155	114
24–25 months	8	224	169	190	136	17	286	170
26–27 months	9	414	264	337	203	15	406	172



Bilingual *N*	9	12	8	7	8	9
Monolingual *N*	8	10	20	21	17	15

Figure 6. Bilingual and monolingual production (percentiles)

performed comparably to the monolingual children. A *t*-test comparing the mean for the English-dominant children's English production to the mean for the monolinguals' production revealed this difference was not significant, (ML M=34.8, SD=26.2 vs. BL M=38.4, SD=25.9), $t(38)$=–.33, *ns*. Similarly, a *t*-test comparing the Spanish-dominant children's Spanish performance to the monolingual children's performance (BL M=23.6, SD=20.6 and ML M=34.8) was not significant, $t(44)$=1.38, *ns*.

Analogous figures for comprehension are represented in Figures 3 and 4. With respect to comprehension, both double-language measures of bilingual vocabulary were higher than the monolingual average percentile, although these differences were not significant (BL M=47.9, SD=27.9 vs. ML M=30.3, SD=27.0, $t(18)$=–1.78, *ns* for bilingual Total Vocabulary and BL M=44.3, SD=26.1 vs. 30.3, $t(18)$=–1.51, *ns* for Total Conceptual Vocabulary).

As seen in Figure 4, in comprehension both groups of bilingual subjects performed better than did their monolingual counterparts in all but their weaker language. Due to the very small sample sizes involved in these comparisons, we did not do statistical tests of significance for the single-language comprehension measures.

Further, a cautionary note may be advisable: It is conceivable, especially for those families in which a single individual filled out both the English and Spanish forms, that bilingual parents' responses to the CDI for comprehension may have been somewhat overestimated compared to monolinguals'. Indeed, bilingual parents sometimes reported difficulty knowing in which language an interchange was taking place, so understanding in both languages may have been credited on the basis of comprehension in only one.

To evaluate further the two groups' similarity in vocabulary production throughout the age range, we plotted the average number of words produced by the bilingual and monolingual children between 16 and 27 months, the ages for which we had at least 7 subjects in each group. (See Fig. 5.) To smooth the curve and increase the number of observations at each point, these data were collapsed into two-month groupings (but no child contributed more than one score to any one time point). The double-language measures—Total Vocabulary and Total Conceptual Vocabulary—were used for the bilingual group. Standard deviations associated with these means are given in Table 1.

This comparison of the monolingual and bilingual children reveals that differences in average vocabulary size across the age range tested were relatively small. Neither group was consistently higher or lower than the other. Both groups seemed to follow the same general upward trend; both groups have large variability around their means, with standard deviations in most cases approximately three-quarters the size of the mean. Considering the small sample sizes and the large standard deviations, any apparent between-group differences should be interpreted with caution.

The same graph was next plotted using the means of the children's percentile scores for monolingual production, bilingual Total Vocabulary production and bilingual Total Conceptual Vocabulary production at these same ages. Figure 6 reveals that the average percentiles for both the bilinguals and the monolingual comparison group fell in the third quartile at all 6 time points. As

mentioned above, this may indicate that the instructions given to these parents were more stringent and thus encouraged more conservative judgment criteria than did those given to the norming group parents. That the curves were fairly horizontal indicates that both language groups showed vocabulary acquisition rates similar to those of the norming sample.

DISCUSSION

Unlike previous studies (Ben-Zeev, 1977; Doyle et al., 1978; Rosenblum & Pinker, 1983; Umbel et al., 1992) that indicated a deficit in receptive vocabulary of bilingual children, the data presented here suggest, though tentatively given the small sample sizes especially for comprehension, that bilingual children's ability to understand two languages may be comparable *in each language* to monolingual children's. For productive vocabulary, no comparable studies but a wealth of anecdotal evidence have been reported to help predict how the bilingual children's performance would compare to monolinguals'. Given that vocabulary production requires an additional performance from the child (one must understand a word to produce it appropriately, but the reverse is not true), bilingual children's productive vocabularies might have been expected to show a greater deficit with respect to monolinguals' than their comprehension vocabularies. In our data, the bilingual children's productive capabilities seemed more evenly split between the languages, and although each individual language showed fewer words than in the monolingual children, measures of the bilingual child's production *in the two languages together* indicated comparable vocabularies for bilingual and monolingual children.

The present work suggests that the type of vocabulary information needed when comparing bilingual children to monolingual children will depend on the purpose of the comparison. There are diverse uses for single-language and double-language measures of bilingual children's abilities. Often, the comparison of bilinguals' skills to those of monolingual controls is framed with reference to

one or the other of the bilinguals' languages. It may be important, for example, to know how well a child controls the majority language, the one in which school instruction will take place. Or, to assess the more general relationship of linguistic knowledge to cognitive growth, one may focus on how well the child commands *any* language, regardless of which one is the majority language. In such cases, comparing bilinguals' single-language performance with monolinguals' may be justifiable.

However, if one's goal in investigating bilingual vocabulary is to provide an estimate of educational potential, to screen for language delay, or to provide the basis for comparison with monolingual vocabulary size in terms of lexicalized concepts, then measures that evaluate the bilingual child's ability in both languages would seem more revealing and appropriate. Two such double-language measures are the Total Vocabulary (TV) and Total Conceptual Vocabulary (TCV) discussed in this paper. As it happens, both measures show empirical values that are very close to monolingual production values throughout the age range of the study (Fig. 5).

The mapping of one language form of the CDI onto the other allows us to approximate how much of a bilingual child's lexicon is represented in each language uniquely, and how much in both languages. If there were no words known in the second language that were not already known in the first, there might be no need for a Total Language measure. The child's dominant language would be adequate for comparison of lexical concepts to monolinguals. Our observations, however, show that this is rarely the case. Even children who are very weak in a second language generally have some singlets in that language (Pearson & Fernández, 1992; Umbel et al., 1992). Therefore, any language measure based on only one language will fail to credit the child with knowledge unique to the "other" language. Additionally, that the bilingual double-language measures are so similar to monolingual production may suggest that either the number of sound-meaning pairings (TV) or the number of lexicalized concepts (TCV) may be the factor guiding the rate of expressive vocabulary acquisition.

Whereas either Total Vocabulary or Total Conceptual Vocabulary may be an appropriate measure in some situations, it is still not always clear how to choose between these measures. Deciding which is more appropriate at a given age will hinge on what counts as a word. For every phonetic shape that the child produces consistently enough for the observer to recognize it as an instance of a given word, the child has established a sound-meaning pairing. Whatever the reason, within-language synonyms and hyponyms (like dog and Rover for the same pet) are rare in early child speech (Clark, 1983). Generally, a count of the number of words a monolingual child responds to and uses will correspond fairly closely to the number of concepts for which the child has a lexical representation.

But, for a bilingual child who knows, say, 10 words in English and 15 words in Spanish, one has several candidates for which number to use in the comparison. The count of the sound-meaning pairings and the count of the number of lexicalized concepts, which yielded approximately the same number for a monolingual lexicon, now yield different numbers. If one is to count sound-meaning pairings, this will be the Total Vocabulary. On the other hand, if one is interested in the number of lexicalized concepts, Total Conceptual Vocabulary is more appropriate.

The more conservative estimate of the bilingual child's lexicon is the Total Conceptual Vocabulary. However, this measure may mislead in that some apparent translation equivalent pairs, matched on the basis of their meanings for adults, may *not* be semantically equivalent for the child. Volterra and Taeschner (1978) present examples in which German and Italian potential doublets were used by the child to talk about different referents. Several of the parents in our study also have related such examples: *barco* being used for sailboats (triangles actually) and *boat* being used for all other boats, or *zapatos* being reserved for one special pair of sneakers and *shoes* being used for all the others. On the other hand, this may not always be the case. In our lab, we observe many examples of the child treating adult doublets as equivalents, asking for *keys* and *llaves*, playing one day with the *martillo* and

another day with the same yellow plastic *hammer*. The most accurate estimate of a bilingual child's real conceptual vocabulary is probably somewhere between the Total Conceptual Vocabulary and Total Vocabulary as measured here. Our analyses consider both. Thus far, no statistical outcomes have been different for one measure or the other, but our samples have been of limited size.

The striking similarity of Total Vocabulary and Total Conceptual Vocabulary to the monolingual patterns suggests that these double-language measures may share a similar cognitive underpinning and react to the same constraints on the child's knowledge—be they limits on memory, on perceptual categorization, or perhaps on motor programming and control of the vocal tract. At a very concrete level, the bilingual child's exposure to a given language is divided in a way that a monolingual's is not. The double-language measures correspond to the bilinguals' response to *all* of their language experience, rather than just one piece of it. To equate time of exposure to a given language for both a bilingual and a monolingual child, even in a thought experiment, the monolingual infant would have to be one who was not receiving any language stimulation for a portion of the day, corresponding to the time the bilingual was interacting with speakers of the other language. Or, stimulation in one language would have to be seen to give rise to vocabulary in the other, a situation not generally observed (Pearson & Fernández, in progress). For a bilingual toddler to have two lexicons each equivalent in size to a monolingual's would mean somehow overcoming the memory constraints that operate on young children's lexicons and being in a situation in which the needs for given words in the two language environments did not differ. To the extent that lexical development provides a window into the child's conceptual development, it is important to determine empirically how much lexical knowledge in one language overlaps with the lexical knowledge in the other and how much is encompassed by the two languages together. The comparison between Total Vocabulary and Total Conceptual Vocabulary provides an indication of the extent of that overlap.

Of the various language measures described here, single-

language measures may be of more interest to educators, whereas a child's total language ability may be of more interest to clinicians. Indeed, there is as yet little agreement as to the criteria for language delay in monolinguals in this age range. Vocabulary production is only one measure that has been proposed, and it is generally seen as a screening device (Rescorla, 1989). When delay is suspected, other language behaviors are examined. Assessments of comprehension appear to be as important as assessing production (Thal, Tobias, & Morrison, 1991).

Furthermore, the effectiveness of the norms used here continues to improve. Separate norms are currently being developed for Spanish-speaking children (D. Thal, personal communication, 9 May 1992), and these will improve our percentile analyses of Spanish vocabulary. However, to our knowledge there are still no norms referenced to bilingual development on the horizon. It will be an empirical question whether monolingual norms can be used as a reliable substitute for genuine bilingual ones. That bilinguals' pattern of Total Conceptual Vocabulary and Total Vocabulary growth closely corresponds to the lexical development of monolingual control groups encourages us to think that bilingual norms for this skill at these ages, if they existed, would be very similar to monolingual norms. Therefore, current norms and guidelines for identifying delay should be adequate for bilinguals—provided the bilinguals' performance in two languages is taken into account.

Using the range of measures presented here, there is no statistical basis for concluding that the bilingual children in this study were slower to develop vocabulary before the age of 30 months than were the monolinguals. Indeed, bilinguals' comprehension may have been superior to monolinguals'. Further research is necessary to verify patterns identified here. In production, the bilinguals' mean percentile for a single language appeared to be lower than the monolinguals' but the differences were not statistically significant. Productive vocabulary for the two languages summed together in bilingual children was comparable to productive vocabularies of monolingual age-mates.

The wide range of vocabulary sizes observed at these ages in normally developing children (Fenson et al., 1991) was observed in these bilingual children as well.

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