Vocabulary Size and Accuracy of Monolingual and Bilingual Preschool Children

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1. Introduction

1.1 Rationale for the study

Large numbers of children in the world are acquiring one language as their native language and subsequently learning another. There are also many children who are acquiring two or more languages simultaneously in early childhood as part of the natural consequences of being a member of bilingual families and communities. Because bilingualism brings about advantages to children that have an effect on their future development, understanding differences between monolinguals and bilinguals becomes a question of interest. However, on tests of vocabulary bilinguals frequently seem to perform at lower levels than monolinguals (Ben Zeev, 1977b; Doyle, Champagne, & Segalowitz, 1978). The reason for this seems to be that bilingual children have to learn two different labels for everything, which reduces the frequency of a particular word in either language (Ben Zeev, 1977b). This makes the task of acquiring, sorting, and differentiating vocabulary and meaning in two languages much more difficult when compared to the monolingual child's task in one language (Doyle et al., 1978).

Many researchers (Genesee & Nicoladis, 1995; Patterson, 1998; Pearson, Fernandez, and Oller, 1993) have raised questions about the appropriateness of using monolingual vocabulary norms to evaluate bilinguals. In the past, when comparing monolingual and bilingual performance, researchers mainly considered only one language of the bilingual (Ben Zeev, 1977b; Bialystok, 1988; Doyle et al., 1978). However, there is considerable evidence of a vocabulary overlap in the lexicon of bilingual children's two languages, differing from child to child (Umbel, Pearson, Fernandez, and Oller, 1992). This vocabulary overlap is attributed to the child acquiring each language in different contexts resulting in some areas of complementary knowledge across the two languages (Saunders, 1982). It is crucial to examine both languages of bilingual children and account for this overlap in order to assess the size of bilinguals' vocabulary with validity. This has been very difficult to do, since there are a few standardized measures for vocabulary knowledge in two languages concurrently and no measure are normed for bilingual preschool age children.

It has been suggested that when the vocabulary scores of tests in both languages of the bilingual child are combined, their vocabulary equals or exceeds that of monolingual children (Bialystok, 1988; Doyle et al., 1978; Genesee & Nicoladis, 1995). However, this measure of Total Vocabulary (total scores achieved in language A + language B) is not sufficient for the examination of differences in vocabulary size of bilinguals and monolinguals due to the vocabulary overlap. A measure of total unique words or Conceptual Vocabulary, which is a combination of vocabulary scores in both languages considering words describing the same concept as one word, provides additional information about bilinguals' vocabulary size with regards to knowledge of concepts.

Pearson et al. (1993) conducted the only study considering both Total Vocabulary (language A + language B) and Conceptual Vocabulary (language A U language B) for bilingual children in comparison to their monolingual peers. Based on a sample of 25 simultaneous English/Spanish bilinguals and 35 monolinguals it was suggested that there exists no basis for concluding that the bilingual children were slower to develop early vocabulary than were their monolingual peers. There is a possibility that quite the opposite is true with regards to vocabulary comprehension when both languages are involved. There is a need for further study evaluating vocabulary size of preschool bilinguals to verify patterns identified by Pearson et al. (1993).

 ISB4: Proceedings of the 4th International Symposium on Bilingualism, ed. James Cohen, Kara T. McAlister, Kellie Rolstad, and Jeff MacSwan, 58-77. Somerville, MA: Cascadilla Press.

1.2 Purpose of the study

The purpose of this study was to evaluate differences in receptive and productive vocabulary size of monolingual and bilingual preschool children speaking English and Spanish. The present study built upon prior research, taking into consideration suggestions given by other researchers for improving research designs to yield more accurate and valid results. The findings were based on both languages of the bilingual subjects, while attention was paid to the expected vocabulary overlap. Attention was also paid to factors affecting vocabulary development. A priori variables of similar language background, early onset of bilingualism, and similar level of maternal education provided at least somewhat comparable groups. Age, nonverbal IQ, and gender variables were controlled statistically. Factors possibly influencing vocabulary knowledge that could not be controlled were considered. Standardized language versions of receptive and productive tests were utilized. Appropriate statistical tools were used in analyses of data.

2. Methods

2.1 Subjects

Subjects for this study were selected from English monolingual, Spanish monolingual, and English/Spanish bilingual families residing in Utah County, Utah. The sample was purposeful due to the required characteristics of each subject, such as age (28 to 78 months), onset of bilingualism (prior to 36 months of age), and level of parental education (minimum of high school diploma or equivalent). Subjects' families were recruited through local preschools, church congregations, and through parental networks.

A total of 77 subjects from 69 families agreed to participate. There were 34 male and 43 female subjects, ranging in age from 28 to 78 months, with a mean age of 54.7 months (SD = 11.7 months) and an average nonverbal IQ score of 105.8 (SD = 13.8). The average number of children in the family, including the subjects, was 2.8 ranging from 1 to 9 children in a family. The mean for production of first words in English was 18.9 months and 16.51 months in Spanish. For details see Table 1.

Table 1
Descriptive statistics for all subjects

Variable	N	NA	Mean	Median	Min	Max	SD
Months of Age	77	0	54.69	55	28	78	11.74
Nonverbal IQ	77	0	105.83	103	76	141	13.77
Children/Family	77	2	2.72	2	1	9	1.34
First Word EN	77	5	18.90	18	6	48	10.24
First Word SP	77	16	16.51	12	4	48	9.59

Subjects were divided into five groups based on parental reports and subjects' performance on the receptive and productive tests. All children were tested in English and Spanish prior to their placement into groups. Children who did not pass any of the pretest questions and/or who knew less than two items from the first ten test items on a tests were placed into either the English Monolingual (EN) or the Spanish Monolingual group (SP). Subjects that were neither Monolingual English nor Monolingual Spanish were placed into Bilingual English Dominant (BE), Bilingual Spanish Dominant (BS), or Balanced Bilingual group (BB) based on the difference of their language accuracy ratios (English Correct/English Total Possible - Spanish Correct/Spanish Total Possible). This calculation ensured independence of the explanatory variable (grouping) and response variables (test scores). Subjects with differences in accuracy rates smaller than or equal to 10% for receptive and smaller than or equal to 15% for productive were placed into the Bilingual Balanced Group (BB). Bilingual subjects whose scores were positive and greater than 10% for receptive and 15% for productive accuracy rate differences, indicating that subjects' English accuracy was greater by at least 10% and 15% than their

Spanish accuracy, were placed into the Bilingual English Dominant Group (BE). Subjects, whose scores were negative and smaller than 10% for receptive and 15% for productive accuracy rate differences, indicating greater Spanish accuracy, were placed into the Bilingual Spanish Dominant group (BS).

*Y*oung bilingual children generally differ in their receptive and productive performance in their two languages. This suggested the need for grouping each subject separately for receptive and productive tests. Thus the number of subjects in each group in receptive and productive analyses differs. Tables 2 and 3 display the number of subjects and breakdown by gender in each group by receptive and productive grouping respectively. Mean age in months and nonverbal IQ mean scores with standard deviations for each group are also included.

Table 2
Receptive Groups Size and Characteristics

	N	Gender		Age (months)		Nonverbal IQ	
Group		Male	Female	Mean	SD	Mean	SD
EN	27	11	16	52.6	10.5	112.5	11.7
SP	5	2	3	55.4	17.0	98.0	11.3
BE	12	7	5	54.7	15.0	100.7	13.7
BS	13	4	9	53.4	9.00	104.4	11.5
BB	20	10	10	58.3	11.7	102.8	15.7

Table 3
Productive Groups Size and Characteristics

	N	Gender		Age (months)		Nonverbal IQ	
Group		Male	Female	Mean	SD	Mean	SD
EN	28	11	17	52.8	10.4	112.1	11.6
SP	11	3	8	48.3	13.7	104.2	18.6
BE	14	9	5	62.4	11.0	103.9	16.0
BS	10	4	6	50.7	7.3	98.4	7.6
BB	14	7	7	58.6	11.9	101.7	10.7

2.2 Instruments

Four different instruments were used in this study: the Parental Questionnaire, a nonverbal test of intelligence (Leiter R), a test of receptive vocabulary (Peabody Picture Vocabulary Test), and a test of productive vocabulary (Expressive One Word Picture Vocabulary Test).

The Parental Questionnaire was developed by the researcher in order to explore the subjects' demographic characteristics, communication patterns, and parental attitudes toward child speaking English, Spanish, or being bilingual. The instrument was translated into Spanish by a proficient translator.

Leiter International Performance Scale – Revised (Leiter R) developed by Roid and Miller (1995, 1997) is a nonverbal test of intelligence used to assess children from 2 years of age and does not require speaking from the examiner or the examinee. The nonverbal character of the test as well as the lack of cultural or language bias (Stoelting, 2003) was the main determinants in selection of this test. Since subjects with a variety of linguistic backgrounds were involved, the intent was to evaluate their IQ independent of their native language. Leiter R Brief IQ Screener portion of this battery was utilized to determine IQ. Roid and Miler (1997) report reliability of IQ and the composite Brief IQ Screener scores for 2 to 5 year olds as .88. Further, Leiter R and all its subtests show consistent evidence of validity from content analysis, criterion related, and construct related studies.

The Peabody Picture Vocabulary Test III (PPVT) by Dunn & Dunn (1997) and the Test de Vocabulario en Imagenes Peabody (TVIP) by Dunn, Lugo, Padilla, & Dunn (1986) were standardized measures assessing receptive language skills of the subjects in this study. These tests are nonverbal,

multiple choice picture tests designed to evaluate receptive vocabulary knowledge from ages 2 years 6 months to adult. The Spanish version is slightly shorter than the English version of the test.

The English and Spanish standardized versions of the Expressive One Word Picture Vocabulary Test (EOWPVT and EOWPVT B) by Brownell (2000a) and Brownell (2001) were selected to assess subjects' productive vocabulary. These tests measure a child's ability to make word picture associations based on previous knowledge. These tests are standardized for use with individuals of ages 2 years to 18 years and 11 months. Reliability and validity studies suggest that these tests provide a consistent measure of expressive vocabulary.

Since this research was interested in the actual number of responses rather than in the standard score for both the receptive and productive vocabulary tests, each child was administered items beginning with item 1 until they reached their standardized ceiling score suggested by each test. The raw scores reflected the number of items each child recognized correctly up to the standardized ceiling.

2.3 Procedures

Each subject was administered the standardized IQ Screening Assessment portion of the Leiter R, which assessed subjects' overall intelligence and cognitive abilities. The appropriate language versions of the receptive and productive language tests were administered by trained testers. Only fluent or native speakers of Spanish administered the Spanish language tests. Monolingual children received all vocabulary tests in their native language while bilingual children received the tests in both languages. Based on recommendations from testing manuals, each child was tested on their productive knowledge prior to testing their receptive vocabularies (Brownell, 2000b).

Nonverbal IQ scores were determined following standardized procedures. Composite scores for receptive and productive language were generated by combining vocabulary scores in English and Spanish for all bilingual subjects. This allowed a more valid comparison and statistical analyses of bilingual and monolingual scores. As suggested by Pearson et al. (1993), Total Vocabulary scores (English Correct Score + Spanish Correct Score) and Conceptual Vocabulary scores (English Correct Score + Spanish Correct Score – 1 set of Duplets) were calculated for each subject's receptive and productive vocabulary scores based on the following formulas. Duplets are words that were correctly understood in receptive tests or produced in productive tests in both languages of a bilingual subject. Additionally, vocabulary accuracy rates, which were calculated as a ratio of the raw correct score and the total possible score were calculated and used as part of discussion. The vocabulary accuracy rates reflected the proportion of words children correctly recognized or produced from the given set of vocabulary items.

Data were analyzed in two different ways based on whether one or both languages of bilingual subjects were used. The one way analysis of covariance model was utilized to compare the vocabulary performance scores of the groups controlling for the effects of covariates (age, nonverbal IQ scores, and gender), which are known to influence vocabulary performance. Model assumptions were evaluated and reasonably met. The significance level in all analyses was set to $\alpha = 0.05$, although significance level of $\alpha = 0.01$ is also reported and all actual significance probabilities (p values) are presented. Least squares means were calculated for all groups and preplanned group wise comparisons were made on the group means using 95% nonsimultaneous confidence intervals with Fisher LSD adjustments. Figures were created based on the least square means to graphically display findings.

3. Findings and discussion

This section reviews findings and discussion associated with four sets of analyses. First, findings and discussion of analyses evaluating English receptive and productive vocabulary scores are reported. Second, findings and discussion of analyses evaluating Spanish receptive and productive vocabulary scores of monolingual and bilingual groups are presented. Discussion of findings related to assessing only one language of bilinguals follows. Next, findings and discussion associated with evaluating both languages of bilinguals combined – the receptive and productive Total Vocabularies – are reported,

followed by findings and discussion of receptive and productive Conceptual Vocabulary analyses. Finally, discussion of findings related to evaluating both languages of bilinguals is presented.

3.1 One language of bilingual: English

Findings and discussion of analyses evaluating differences in English vocabulary scores are reported in this section. First, scores on English receptive tests are reported. Findings of analyses of English productive test scores follow. Finally, summary of findings and discussion is presented. Scores used in the analysis were scores on the English receptive test (PPVT) and scores on the English productive test (EOWPVT) for both monolingual and bilingual subjects. The Spanish monolingual group (SP) was not tested on English receptive or productive knowledge.

3.1.1 English receptive vocabulary scores

The results of the analysis of covariance for English receptive vocabulary scores indicate that a significant difference was found between English receptive vocabulary scores of the groups after adjustment was made for age, nonverbal IQ, and gender. The grouping was statistically significant ($F = 22.30$, $p < 0.0001$), explaining 51% of the remaining variance of the model. The covariates age ($F = 92.41$, $p < 0.0001$) and nonverbal IQ ($F = 9.86$, $p = 0.0025$) were also significant explaining 59% and 13% of the remaining variance of the model respectively. The gender covariate was not statistically significant ($F = 0.50$, $p = 0.4831$). The total variance explained by the model was 73%. Note that the total variance does not equal the sum of the partial variances explained by each model variable since the variables in the model are correlated.

Table 4 shows the least square means with standard errors for each group and associated pair wise comparisons. As expected, the English monolingual group (EN) had the highest English receptive scores, followed by English dominant bilinguals (BE), balanced bilinguals (BB), and the Spanish dominant bilingual group (BS). The pair wise group comparison analysis indicated that all group means were significantly different from each other.

Table 4
English Receptive Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

	EN		BE		BB		BS		SP	
LS Mean	48.93	(2.28)	39.71	(3.33)	30.79	(2.59)	18.37	(3.17)	N/A	(N/A)
EN			0.0288	*	<.0001	**	<.0001	**	N/A	
BE					0.0363	*	<.0001	**	N/A	
BB							0.0035	**	N/A	
BS									N/A	

*p<0.05, **p<0.01

3.1.2 English productive vocabulary scores

The results of the analysis of covariance for English productive vocabulary scores show that a significant difference was found between English productive vocabulary scores of the groups after adjustment was made for age, nonverbal IQ, and gender. The grouping was statistically significant ($F = 21.52$, $p < 0.0001$), explaining 52% of the remaining variance of the model. The covariate age ($F = 34.80$, $p < 0.0001$) was also significant explaining, 58% of the remaining model variance. The nonverbal IQ ($F = 3.18$, $p = 0.0798$) and gender ($F = 3.49$, $p = 0.0669$) covariates were not statistically significant. Total variance explained by the model was 70%.

Table 5 shows the least square means with standard errors for each group and associated pair wise comparisons. The same pattern found with English receptive vocabulary was found for productive

vocabulary. The English monolingual group (EN) scored the highest, followed by English dominant bilinguals (BE), balanced bilinguals (BB), and the Spanish dominant bilingual group (BS). The pair wise comparison analysis indicates that the mean of the English dominant bilingual group (BE) was not significantly different from the mean of the balanced bilingual group (BB). All other means were significantly different from each other.

Table 5
English Productive Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

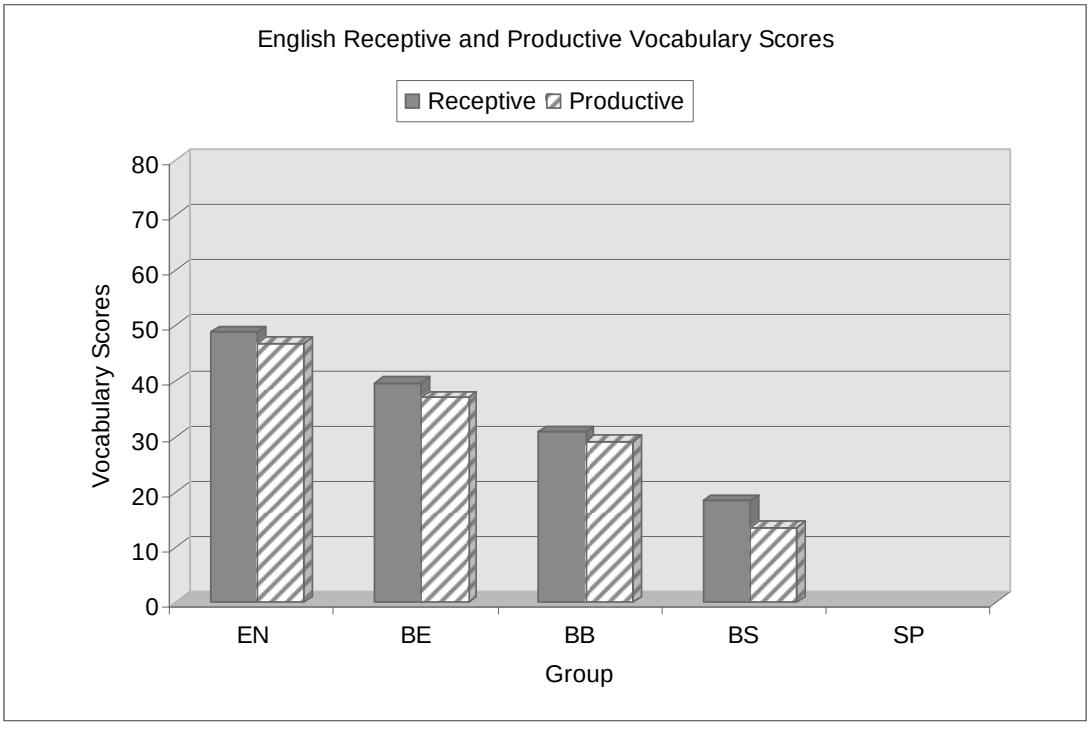
	EN		BE		BB		BS		SP	
LS Mean	46.77	(2.28)	37.12	(3.04)	29.16	(2.94)	13.55	(3.61)	N/A	(N/A)
EN			0.0154	*	<.0001	**	<.0001	**	N/A	
BE					0.0591		<.0001	**	N/A	
BB							0.0013	**	N/A	
BS									N/A	

*p<0.05, **p<0.01

3.1.3 Summary of findings and discussion of one language of bilingual: English

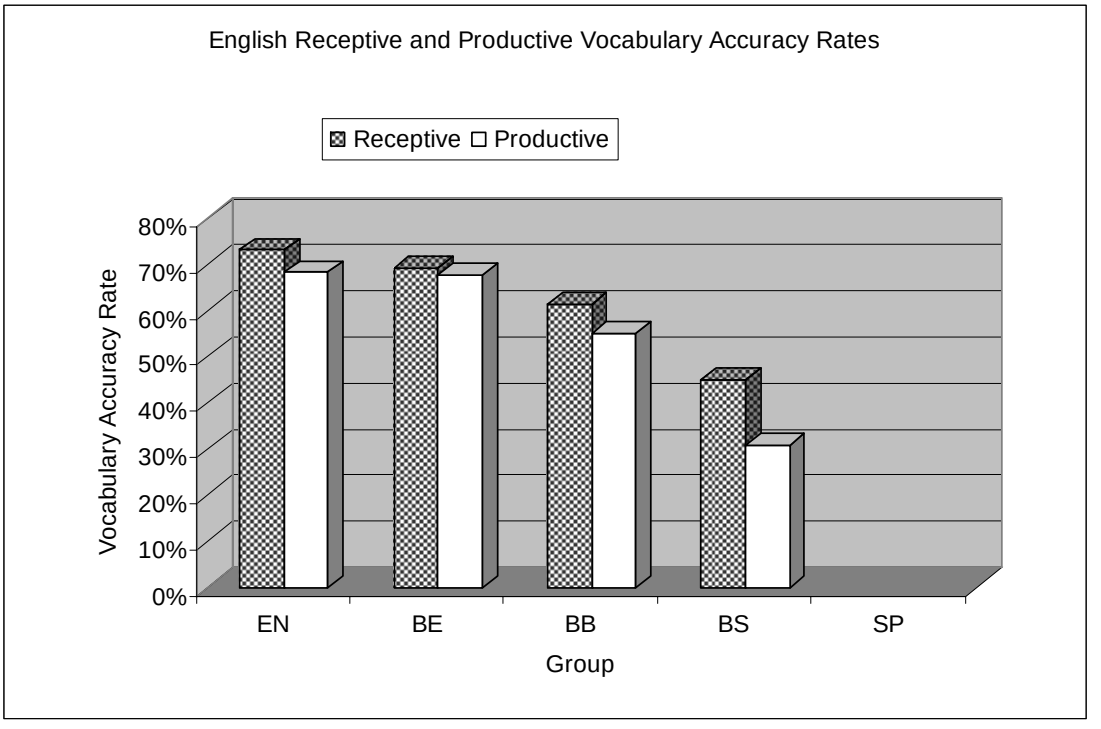
When differences found between monolingual and bilingual groups' vocabulary scores measured in English were evaluated, the findings indicate that grouping was always statistically significant, explaining 51% (receptive) and 52% (productive) of the remaining model's variance. There appears to be a similar trend in the English receptive and productive scores of the four groups as Figure 1 shows.

Figure 1



As expected, receptive scores were higher than the productive scores. English monolinguals (EN) scored significantly higher in English receptive and productive knowledge than did subjects belonging any of the bilingual groups. The English dominant bilingual group (BE) scored higher than the balanced bilingual group (BB), which still scored higher than the Spanish dominant bilingual group (BS). A similar trend was found in receptive and productive vocabulary accuracy rates (Figure 2), however, the decrease in accuracy was more curvilinear.

Figure 2



When only the English receptive and productive vocabulary sizes were measured, the English monolingual group performed better than any of the bilingual groups. These findings reflect the general results reported in the field of bilingual vocabulary research (Argulewicz & Abel, 1984; Ben Zeev, 1977a, 1977b; Doyle et al., 1978; Fernandez, Pearson, Umbel, Oller & Molinet Molina, 1992; Rosenblum & Pinker, 1983; Serapiglia, 1978; Umbel et al., 1992). That is, young bilinguals lag behind their monolingual peers in the size of their English receptive vocabulary. Indeed there seems to be a significant discrepancy favoring the monolinguals when the receptive knowledge of the community language is evaluated. A smaller productive English vocabulary size for bilinguals also makes sense, since productive vocabulary development closely follows receptive vocabulary development. No other research prior to this, has evaluated productive vocabulary size comparing monolingual and bilingual groups. This issues is worthy of further investigation.

3.2 One language of bilingual: Spanish

Findings and discussion of analyses evaluating differences in Spanish vocabulary scores are reported in this section. First, scores on the Spanish receptive test are reported, followed by findings of analyses on the Spanish productive test scores. Finally, summary of findings and discussion is presented. Scores used in the analysis were scores on the Spanish receptive test (TVIP) and scores on the English productive test (EOWPVT B) for both monolingual and bilingual subjects. The English monolingual group (EN) was not tested on Spanish receptive or productive knowledge.

3.2.1 Spanish receptive vocabulary scores

The results of the analysis of covariance for Spanish receptive vocabulary scores give evidence that there was a significant difference between the Spanish receptive vocabulary scores of the groups after adjustment was made for age, nonverbal IQ, and gender. The grouping was statistically significant ($F = 3.36$, $p = 0.0273$), explaining 19% of the remaining variance in the model. The covariates age ($F = 36.60$, $p < 0.0001$) and nonverbal IQ ($F = 4.74$, $p = 0.0350$) were also significant, explaining 46% and 10% of the remaining variance of the model respectively. Gender was not statistically significant ($F = 0.01$, $p = 0.9094$). A total of 55% of the variance was explained by this model.

Table 6 shows the least square means with standard errors for each group and associated pair wise comparisons. The Spanish dominant bilingual group (BS) had the highest Spanish receptive vocabulary score, followed by the balanced bilingual group (BB) and Spanish monolingual group (SP). The English dominant bilingual group had the lowest Spanish vocabulary scores (BE). The pair wise comparison analysis indicated that the only significant difference was found between the mean scores of the English dominant (BE) bilingual group and the Spanish dominant (BS) bilingual group. All other group means were comparable and not significantly different.

Table 6
Spanish Receptive Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

	EN		BE		BB		BS		SP	
LS Mean	N/A	(NA)	21.93	(4.27)	32.15	(3.30)	40.05	(4.11)	25.45	(6.58)
EN	N/A									
BE	N/A				0.0655		0.0041	**	0.6560	
BB	N/A						0.1436		0.3687	
BS	N/A								0.0663	

*p<0.05, **p<0.01

3.2.2 Spanish productive vocabulary scores

The results of the analysis of covariance for Spanish productive vocabulary scores show that significant differences were found between the Spanish productive vocabulary scores of the groups after adjustment was made for age, nonverbal IQ, and gender. The grouping was again statistically significant ($F = 12.23$, $p < 0.0001$), explaining 47% of the remaining variance. The age covariate was

Table 7
Spanish Productive Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

	EN		BE		BB		BS		SP	
LS Mean	N/A	(NA)	11.47	(2.46)	29.45	(2.31)	30.67	(2.82)	26.77	(2.73)
EN	N/A									
BE	N/A				<.0001	**	<.0001	**	0.0003	**
BB	N/A						0.7436		0.4667	
BS	N/A								0.3080	

*p<0.05, **p<0.01

also significant (F = 30.09, p < 0.0001), explaining 42% of the remaining model variance. The nonverbal IQ (F = 0.31, p = 0.5823) and gender (F = 0.69, p = 0.4107) covariates were not statistically significant. The total variance explained was 58%.

Table 7 shows the least square means with standard errors for each group and associated pair wise comparisons. With regards to Spanish productive vocabulary, the Spanish dominant bilinguals (BS) had the highest scores, followed by the balanced bilingual group (BB), Spanish monolingual group (SP), and the English dominant bilingual group (BE). The pair wise comparison analysis indicates that the scores of the English dominant bilinguals (BE) were significantly lower than any other group. However, no other group differences were statistically significant.

3.2.3 Summary of findings and discussion of one language of bilingual: Spanish

When differences found between monolingual and bilingual groups' vocabulary scores measured in Spanish were evaluated, the findings show that grouping was statistically significant, explaining 19% (receptive) and 47% (productive) of the remaining model's variance. Although the Spanish receptive and productive scores also followed a pattern, it was quite different from the trend displayed by the English vocabulary scores. Figure 3 shows the pattern of Spanish vocabulary scores. Receptive scores were generally higher than the productive scores when Spanish vocabulary scores are compared. The only exception is found in the case of the Spanish monolingual group. However, since the group means are estimates and the difference between receptive and productive is so small when compared to the associated standard errors, this unusual disparity can be ignored. Scores of the Spanish dominant group (BS) were always the highest but significantly higher only from the scores of the English dominant bilinguals (BE) in both receptive and productive language. No significant differences were found when the scores of the Spanish monolinguals (SP) were compared to the scores of the balanced bilingual (BB) group. Again, a similar trend was found in receptive and productive vocabulary accuracy rates (Figure 4) with a more curvilinear characteristic.

Figure 3

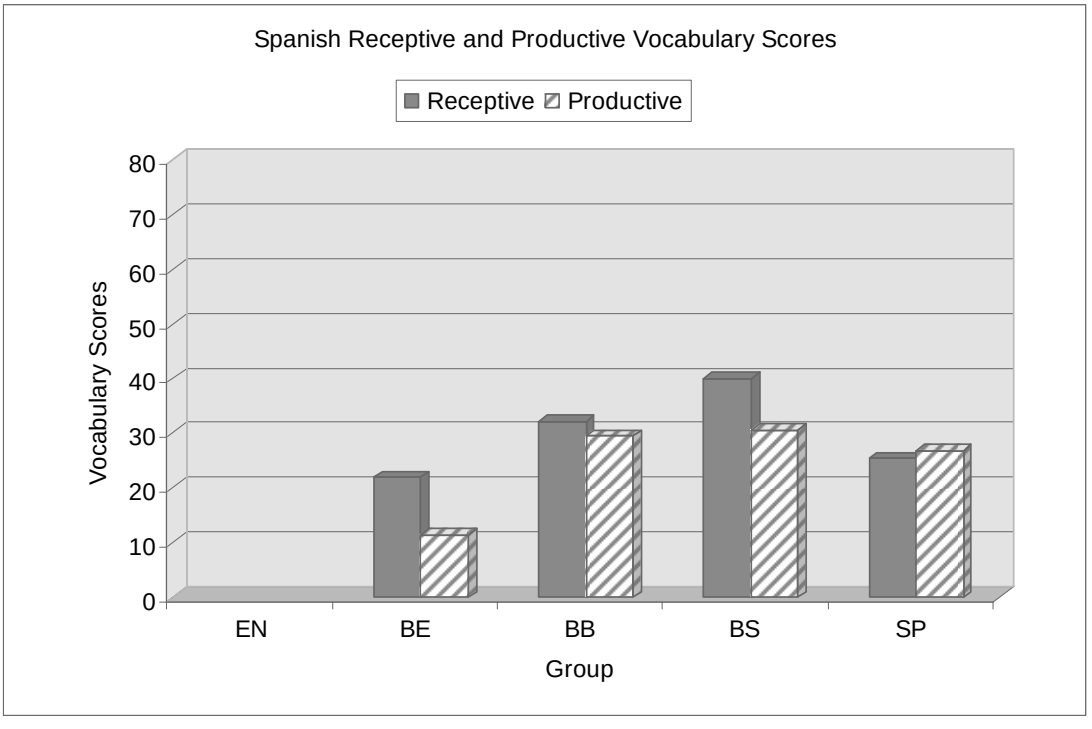
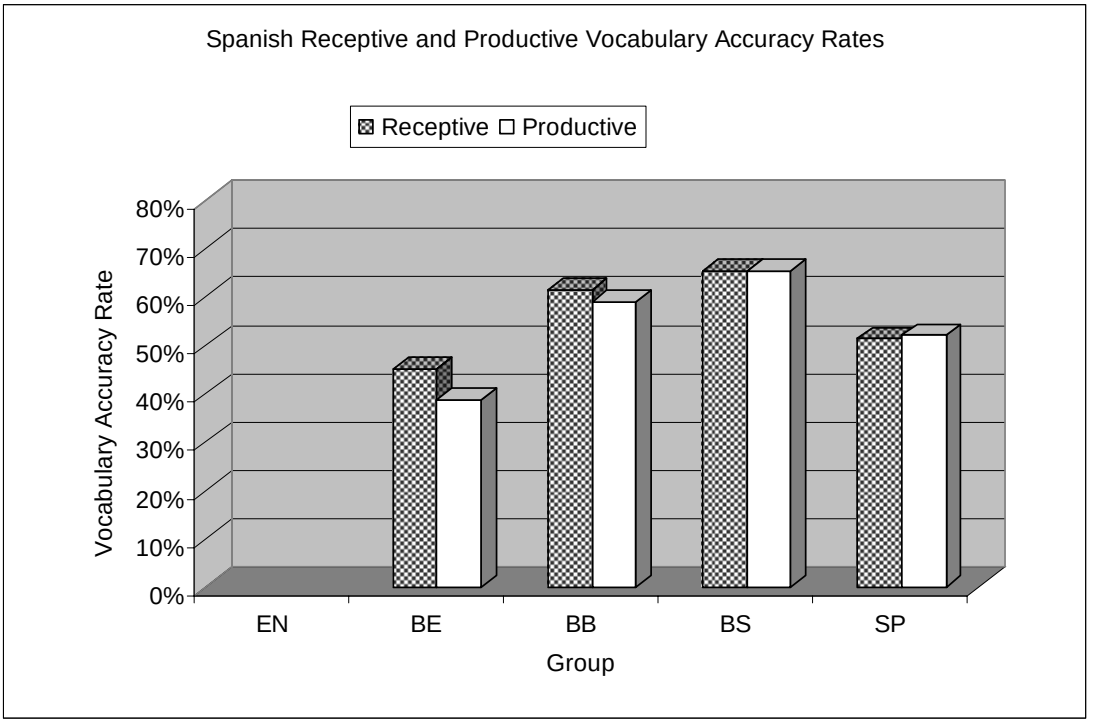


Figure 4



The pattern in Spanish receptive and productive vocabulary scores indicated that there was no difference in the receptive or productive Spanish vocabulary size of monolingual Spanish speakers and balanced bilinguals. Umbel et al. (1992) found similar results with her balanced bilinguals on their Spanish receptive vocabulary, using the same standardized instrument as was used in the current study. The bilingual subjects of Rosenblum & Pinker (1983) had a greater Spanish receptive vocabulary size than the norm. But the researchers in this study used English norms on the Spanish translation of the Peabody Picture Vocabulary Test, which may have not yielded valid interpretation of results. Fernandez et al. (1992) reported vocabulary scores of Spanish/English bilinguals below monolingual norms on the standardized Spanish PPVT. However, their subjects were not balanced bilinguals, which could have negatively affected their vocabulary knowledge even in their dominant language. Again, there are no studies supporting the Spanish productive vocabulary findings, which showed comparable scores for bilinguals and monolinguals, but they reflect a similar pattern to receptive findings just as in the case of English vocabulary.

3.3 Discussion of one language of bilingual

The reasons bilinguals demonstrate lower scores than monolinguals in English and comparable scores in Spanish are not clear. Bilinguals may indeed have temporarily smaller vocabularies in each language because their "developing cognitive capacities impose limitations on the breadth of information that can be stored in accessible memory" (Bialystok, 2001, p. 62). The lower scores may also be related to lower frequencies of words bilinguals are exposed to in either language, as suggested by Ben Zeev (1977b). These two explanations may indicate why there are differences in English scores but not why the scores in Spanish are comparable.

A combination of these two factors, limited cognitive storage and lower frequency of exposure, together with the effects of the linguistic environment imposed on young bilinguals may more fully explain both of these findings. Monolingual English speakers in an English dominant environment are qualitatively and quantitatively positioned to participate in communication events differently than their bilingual peers or their monolingual Spanish speaking peers. Theoretically, their exposure to quality

language input is greater. They have more potential opportunities to interact with a wider group of speakers, which would result in more accurate integration of feedback and faster negotiation of vocabulary meaning. Additionally, they are surrounded by positive attitudes about their language and identity (Spolsky, 1989), which unquestionably foster optimal vocabulary development resulting in greater receptive and productive English vocabulary knowledge.

Spanish monolingual children in an English speaking environment are not positioned the same. Their access to native speakers and a wide variety of input is limited, possibly resulting in slower rates of vocabulary acquisition, and thus smaller vocabulary size when compared to the norm. These children often come from families who just immigrated into the United States. Their parents are working very hard, integrating into society, and learning a new language and new ways of living. This may leave parents little time to spend with their young children. Thus, this transitional period and its consequences may limit the natural linguistic input and interactions available to young Spanish monolinguals, resulting in lower than normal vocabulary scores. These children will most likely begin to acquire English, the dominant language of the community and the language of schooling, within the first year of their arrival. However, it is often the case that the attitudes about maintaining their first language are negative, and these children are encouraged to learn English at the cost of their Spanish proficiency. It is absolutely essential that the Spanish language skills of these children are supported and further developed in and outside the home. Otherwise, these Spanish speaking preschoolers and early elementary graders are very likely to have problems in language development of both languages and are at the greatest risk for future cognitive and academic difficulties.

Bilingual children are found between these two extremes. They do not have optimal input and interaction opportunities in either one of their languages in contrast to the English monolinguals. However, they are not as deprived as the Spanish monolingual children in English dominant environments, because they have access to two linguistic communities. Additionally, community and parental attitudes about speaking English, Spanish, and being bilingual, which are often more positive than in the case of Spanish monolinguals, affect their English and Spanish performance and their success in becoming a proficient bilingual. During the early years, bilinguals may truly have less mastery over either of their languages as the monolingual norm would imply, which is very likely due to cognitive capacity and exposure limitations. However, Genesee and Nicoladis (1995) suggest that this deficit has no long term effect and disappears sometimes during the elementary school grades.

The findings from this section also further illustrate the benefits of bilingualism. Specifically, with regards to English vocabulary size (see Figure 1), the English monolinguals scored the highest, followed by the English dominant bilinguals, followed by the balanced bilingual group, with the Spanish dominant bilinguals scoring the lowest. This trend suggests that when learning English, whether the learner is monolingual or bilingual, there is an advantage to being in an English dominant environment. However, the impact of being in an English dominant environment is even more salient and negative on the Spanish language development of monolinguals and bilinguals. For Spanish vocabulary size, it would be expected that the Spanish monolinguals would score the highest. On the contrary, the Spanish dominant bilinguals had the highest scores in Spanish, followed by comparable scores for the balanced bilinguals and the Spanish monolingual group (see Figure 2). As expected, the English dominant bilinguals had the lowest scores. These findings suggest a disadvantage for development of Spanish in an English speaking environment by learners in general and an advantage in Spanish learning brought on by bilingualism. This finding can be explained by Cummins (2000) interdependence hypothesis, which argues that skills developed in one language transfer and support development of another language. The Spanish dominant bilinguals have the highest scores, because they are bilingual and have the highest Spanish proficiency of all bilingual groups. The Spanish monolingual speakers perform worse, because they do not have the additional support of English input in their vocabulary learning.

In summary, the above findings illustrate the effects of an English dominant environment and bilingualism on vocabulary knowledge of English and Spanish monolingual and bilingual children. Additionally, these findings show the limitations of testing bilinguals in only one of their languages, but it also confirms the importance of differentiating among bilinguals based on measures of proficiency in both languages.

3.4 Two languages of bilingual: total vocabulary

Findings and discussion of analyses evaluating differences in combined receptive and productive Total Vocabulary scores are reported, followed by summary of findings and discussion. The scores of monolingual subjects were scores on the appropriate language version of the receptive and productive tests. The Total Vocabulary scores of bilingual subjects were a sum of scores from the two language versions, reflecting bilinguals' ability to recognize or produce vocabulary items in any of their languages.

3.4.1 Receptive total vocabulary scores

When results of the analysis of covariance for receptive Total Vocabulary scores are evaluated, it appears that a significant difference was found between the receptive vocabulary scores of the five groups after adjustment was made for age, nonverbal IQ, and gender. The grouping factor was statistically significant ($F = 5.04$, $p = 0.0013$), explaining 23% of the remaining variance in the model. The covariates age ($F = 89.06$, $p < 0.0001$) and nonverbal IQ (10.69, $p = 0.0017$) were also significant, explaining 56% and 13% of the remaining model's variance respectively. The covariate gender ($F = 0.09$, $p = 0.7628$) was not significant. This model accounted for 65% of the total variance.

Table 8 shows the least square means with standard errors for each group and associated pair wise comparisons. The bilingual balanced group (BB) had the highest receptive Total Vocabulary score, followed by the bilingual English dominant group (BE), the bilingual Spanish dominant group (BS), and the English monolingual group (EN) scores with the Spanish monolingual group (SP) being the lowest. Pair wise group comparison analysis indicated that the scores of the Spanish monolingual group (SP) were significantly lower than the scores of any other group. Additionally, the balanced bilingual (BB) groups had significantly higher receptive Total Vocabulary scores than either the English monolingual (EN) group or the Spanish monolingual (SP) group.

Table 8
Receptive Total Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

	EN		BE		BB		BS		SP	
LS Mean	48.63	(3.80)	60.89	(5.52)	64.10	(4.28)	57.51	(5.26)	26.65	(8.52)
EN			0.0776		0.0101	*	0.1776		0.0235	*
BE					0.6441		0.6603		0.0011	**
BB							0.3357		0.0002	**
BS									0.0028	**

*p<0.05, **p<0.01

3.4.2 Productive total vocabulary scores

The results of the analysis of covariance for productive Total Vocabulary scores shows that significant differences were found between the productive Total Vocabulary scores of the five groups after adjustment was made for age, nonverbal IQ, and gender. The grouping was statistically significant ($F = 8.06$, $p < 0.0001$), explaining 32% of the remaining variance of the model. The covariate age was also significant ($F = 57.59$, $p < 0.0001$), explaining 46% of the remaining model variance. Nonverbal IQ ($F = 2.81$, $p = 0.0980$) and gender ($F = 3.42$, $p = 0.0686$) covariates were not statistically significant. The total variance explained by the model was 69%.

Table 9 shows the least square means with standard errors for each group and associated pair wise comparisons. The balanced bilingual group (BB) had the highest productive Total Vocabulary score, followed by the bilingual English dominant group (BE), the English monolingual group (EN), the bilingual Spanish dominant group (BS) scores, with the scores of the Spanish monolingual group (SP)

being the lowest. Pair wise group comparison analysis indicated that the scores of the Spanish monolingual group (SP) were significantly lower than the scores of any other group. Additionally, the scores of the balanced bilingual group (BB) were found to be significantly greater than the productive Total Vocabulary scores of the English monolingual (EN) and the Spanish dominant (BS) groups.

Table 9
Productive Total Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

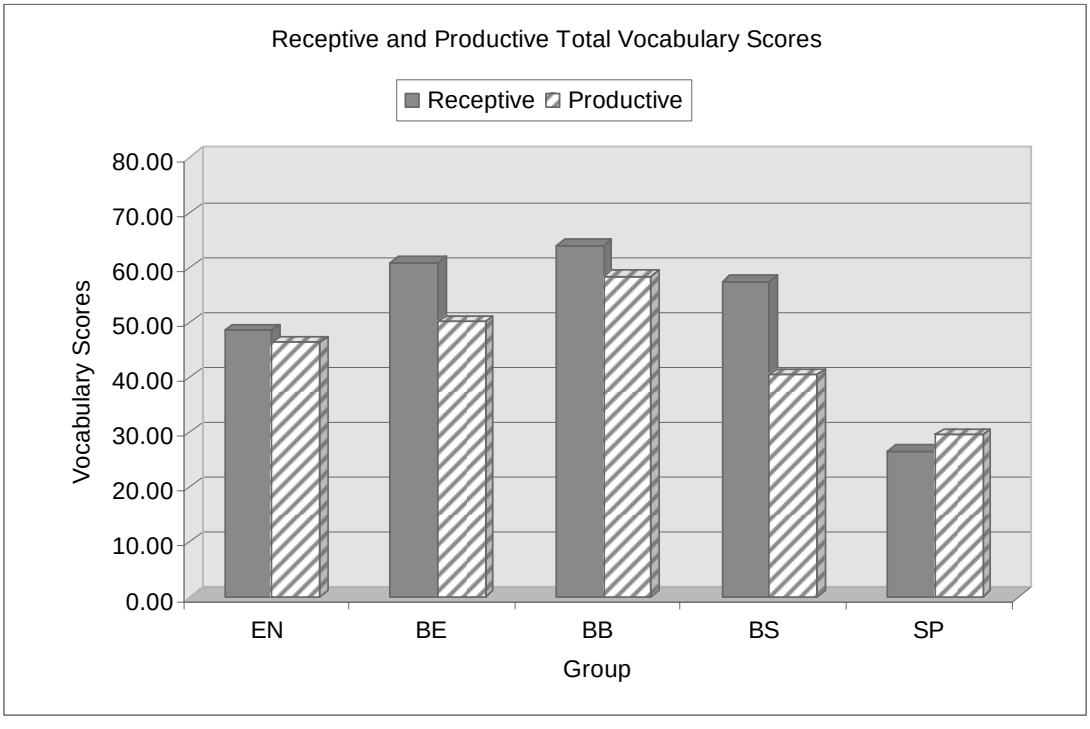
	EN		BE		BB		BS		SP	
LS Mean	46.36	(2.46)	50.20	(3.52)	58.35	(3.40)	40.51	(4.09)	29.47	(3.90)
EN			0.3824		0.0067	**	0.2347		0.0005	**
BE					0.0919		0.0830		0.0003	**
BB							0.0013	**	<.0001	**
BS									0.0487	*

*p<0.05, **p<0.01

3.4.3 Summary of findings and discussion of two languages of bilingual: total vocabulary

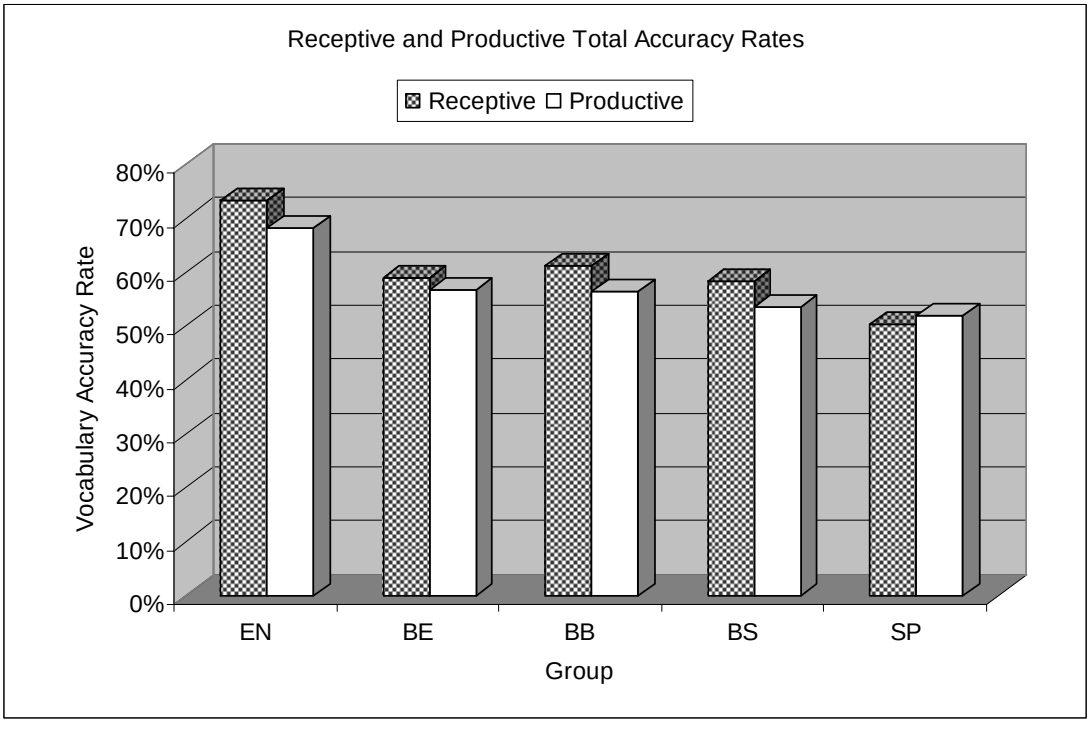
When differences found between monolingual and bilingual groups' Total Vocabulary scores were evaluated, the findings show that grouping was again statistically significant, explaining 23% (receptive) and 32% (productive) of the remaining model's variance. Figure 5 shows the receptive and productive Total Vocabulary group mean estimates. Receptive scores were higher than the productive

Figure 5



scores except in the case of the Spanish monolingual group for the same reason as explained in section 3.2.3. Both receptive and productive Total Vocabulary scores of the balanced bilingual group (BB) were significantly higher than either English (EN) or Spanish monolingual group (SP) scores. Additionally, the Spanish monolingual group (SP) had significantly lower scores than the English monolingual (EN) or any of the bilingual groups. No significant differences were found between the English monolingual group (EN) scores and the scores of English dominant (BE) or Spanish dominant (BS) bilinguals. And the scores of the balanced bilingual group (BB) were also not significantly different from the scores of English dominant (BE) or Spanish dominant (BS) bilinguals, except in case of productive Total Vocabulary, when balanced bilinguals (BB) did perform significantly higher than the Spanish dominant bilingual (BS) children. The Total Vocabulary accuracy rates (Figure 6) reflected the ability of English monolinguals (EN) to recognize and produce a greater proportion of vocabulary items from given set.

Figure 6



When the receptive and productive Total Vocabulary sizes are evaluated, it appears that the bilingual balanced group performed better in vocabulary knowledge than either the English or Spanish monolingual group. This indicates that early bilinguals recognize and produce more words in their two languages than even the advantaged English monolinguals in their one language. Pearson et al. (1993) found similar results, although using different measures of receptive and productive vocabulary knowledge. Analogous findings were also theoretically suggested by Bialystok (2001) and Umbel et al. (1992).

3.5 Two languages of bilingual: conceptual vocabulary

Findings of analyses evaluating differences in Conceptual Vocabulary scores are reported next. The scores of monolingual subjects were scores on the appropriate language version of the receptive and productive tests. Note that Total and Conceptual Vocabulary scores of monolingual subjects are the same, since only one language is involved. The Conceptual Vocabulary scores were calculated as a

sum of scores from the two language versions of the receptive or productive tests minus a number of items known in both of the languages (duplets). This score reflected bilinguals' ability to recognize or produce labels of concepts or independently of the language used.

3.5.1 Receptive conceptual vocabulary scores

The results of the analysis of covariance for receptive Conceptual Vocabulary scores show that a significant difference was found between receptive Conceptual Vocabulary scores of the five groups after adjustment was made for age, nonverbal IQ, and gender. The grouping was statistically significant ($F = 3.69$, $p = 0.0088$), explaining 18% of the remaining variance of the model. The covariates age ($F = 92.11$, $p < 0.0001$) and nonverbal IQ ($F = 10.53$, $p = 0.0018$) were also significant explaining 57% and 13% of the remaining variance respectively. Gender ($F = 0.23$, $p = 0.6355$) was not statistically significant. The total variance explained was 64%.

Table 10 shows the least square means with standard errors for each group and associated pair wise comparisons. The balanced bilingual group (BB) had the highest receptive Conceptual Vocabulary score, followed by the bilingual English dominant group (BE), the bilingual Spanish dominant group (BS), the English monolingual group (EN) scores, with the scores of the Spanish monolingual group (SP) being the lowest. Analysis of pair wise group comparisons indicated that the scores of the Spanish monolingual group (SP) were significantly lower than receptive Conceptual Vocabulary scores of any other group. No other differences between group means were statistically significant.

Table 10
Receptive Conceptual Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

	EN		BE		BB		BS		SP	
LS Mean	48.72	(3.42)	56.41	(4.98)	57.02	(3.86)	52.23	(4.74)	26.32	(7.68)
EN			0.2166		0.1197		0.5525		0.0109	*
BE					0.9223		0.5458		0.0015	**
BB							0.4366		0.0006	**
BS									0.0052	**

*p<0.05, **p<0.01

3.5.2 Productive conceptual vocabulary scores

The results of the analysis of covariance for productive Conceptual Vocabulary scores indicate that a significant difference was found between the productive Conceptual Vocabulary scores of the five groups after adjustment was made for age, nonverbal IQ, and gender. The grouping factor was statistically significant ($F = 7.57$, $p < 0.0001$), explaining 30% of the remaining model's variance. The covariates age ($F = 64.02$, $p < 0.0001$) and gender ($F = 4.06$, $p = 0.0477$) were also significant explaining 48% and 6% of the remaining variance in the model respectively. The covariate nonverbal IQ ($F = 2.69$, $p = 0.1052$) was not statistically significant. The total variance explained by the model was 59%.

Table 11 shows the least square means with standard errors for each group and associated pair wise comparisons. The English monolingual group (EN) had the highest productive Conceptual Vocabulary score, followed by the bilingual English dominant group (BE), the balanced bilingual group (BB), and the bilingual Spanish dominant group (BS) scores. The scores of the Spanish monolingual group (SP) were the lowest. Pair wise group comparison analysis indicates that the scores of the English monolingual group (EN) were significantly greater than the scores of any other group. Additionally, the scores of the Spanish monolingual group were significantly lower than scores of the English dominant bilingual (BE) and the balanced bilingual (BB) groups.

Table 11
Productive Conceptual Vocabulary
Estimated Group Means (Standard Errors) and Pair wise Group Comparisons

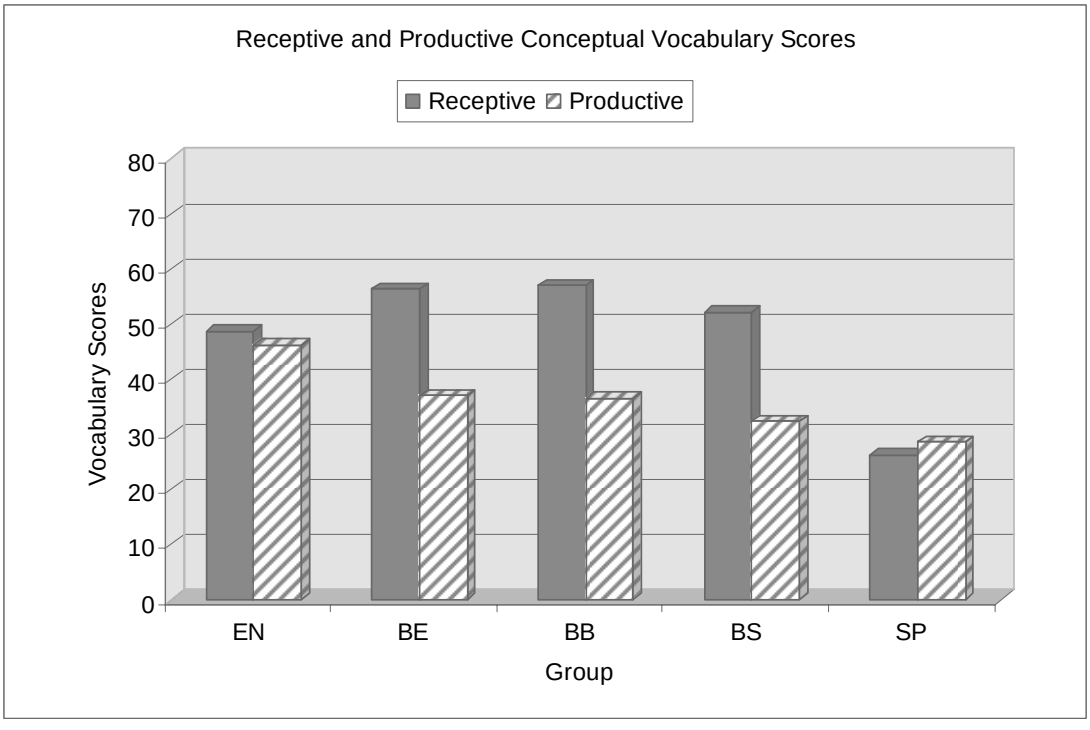
	EN		BE		BB		BS		SP	
LS Mean	46.26	(1.95)	37.04	(2.79)	36.48	(2.69)	32.36	(3.24)	28.56	(3.09)
EN			0.0095	**	0.0052	**	0.0006	**	<.0001	**
BE					0.8823		0.2877		0.0435	*
BB							0.3313		0.0489	*
BS									0.3380	

*p<0.05, **p<0.01

3.4.3 Summary of two languages of bilingual: conceptual vocabulary

When differences found between monolingual and bilingual groups' Conceptual Vocabulary scores were evaluated, the findings show that grouping was again statistically significant, explaining 18% (receptive) and 30% (productive) of the remaining model's variance. Figure 7 shows the receptive and productive Conceptual Vocabulary score group mean estimates. Conceptual Vocabulary scores of the two monolingual groups were the same as their Total Vocabulary scores. The Spanish monolingual group (SP) scored significantly lower on the Conceptual Vocabulary than any other group, except in the case of productive Conceptual Vocabulary, when there was no difference between

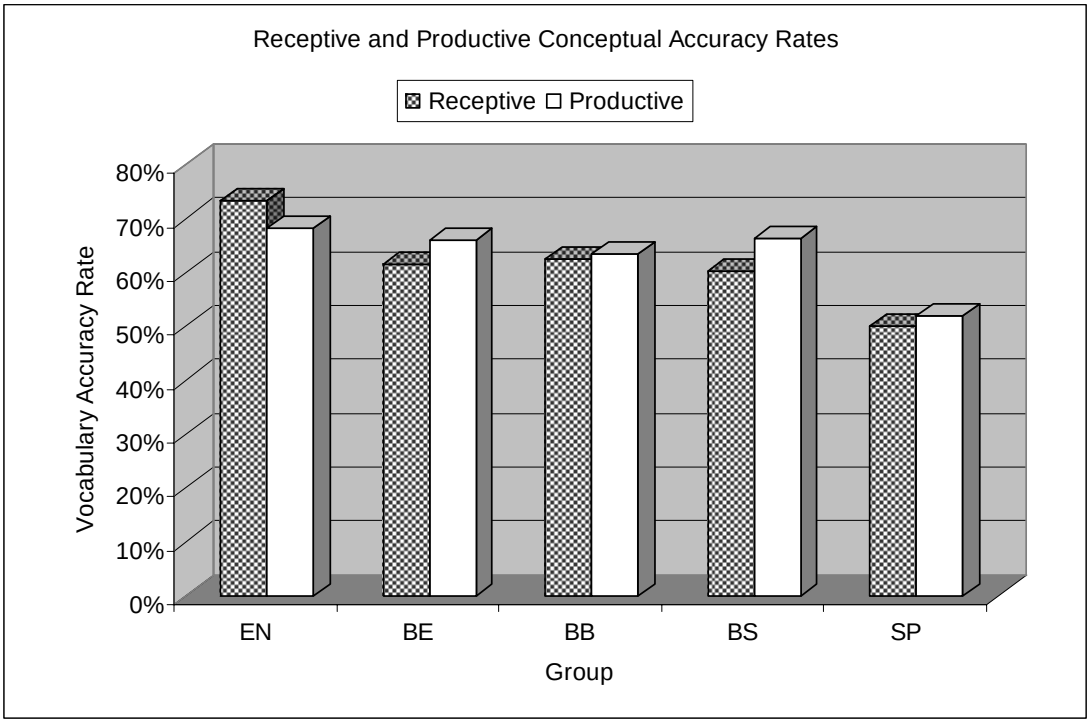
Figure 7



scores of the Spanish monolinguals (SP) and Spanish dominant bilinguals (BS). For receptive Conceptual Vocabulary scores, there were no significant differences among the English monolingual group (EN) and any of the bilingual groups. However, with regards to productive Conceptual Vocabulary, the English monolinguals (EN) performed significantly higher than any of the bilingual

groups or the Spanish monolingual group (SP). Figure 8 displays the Conceptual Vocabulary accuracy rates and reflects a similar trend as with the Total Vocabulary accuracy rates: the English monolinguals (EN) were able to recognize and produce a greater proportion of vocabulary items from given set.

Figure 8



With regards to Conceptual Vocabulary knowledge, the bilingual group and the English monolingual group had comparable receptive scores, which were greater than the scores of the Spanish monolingual group. This suggests that the number of concepts understood by bilingual children is comparable to that of their English monolingual peers. However, the Spanish monolinguals in an English speaking environment recognize fewer concepts than either bilinguals or English monolingual children. Productive Conceptual Vocabulary scores of the English monolingual children were higher than other groups. At the same time, the bilingual group scored higher than the Spanish monolingual group. This indicates that the English monolinguals are able to speak about more concepts than do bilingual children, who are able to speak about more concepts than the Spanish monolinguals. However, these findings are not conclusive since this is the first research study evaluating the productive Conceptual Vocabulary of preschool children.

3.6 Discussion of two languages of bilingual

When tested in both languages, preschool bilinguals do not seem to demonstrate memory or input limitations in their receptive or productive knowledge of linguistic labels related to concepts. Furthermore, bilinguals may demonstrate a higher level of vocabulary knowledge, because they have access to and participate in communication events in two language communities as opposed to their English or Spanish monolingual counterparts. Although the English monolinguals show an advantage with regards to English vocabulary knowledge, this is only relative since a single language measure misses the extent of bilinguals' vocabulary knowledge as Fernandez et al. (1992) and Umbel (1992) argue.

Bilingual children do not develop slower than their monolingual peers as many fear. Their vocabulary size and thus the rate of their vocabulary development appear weaker only when one language is evaluated. When the combined vocabulary size is evaluated, bilinguals are the ones that enjoy the added benefit of having access to two languages and two communities of speakers enriching their vocabulary development, which results in a greater Total Vocabulary size of their receptive and productive knowledge.

Differences between the Total Vocabulary scores and the Conceptual Vocabulary scores of bilingual subjects in this study support the existence of a significant vocabulary overlap in bilinguals' vocabularies just as Pearson et al. (1993) and Umbel et al. (1992) found. This overlap indicates that bilingual children are efficient in their vocabulary and concept acquisition and often learn labels in both of their languages for a common concept. There are words related to concepts, however, that bilinguals use only in one of their languages since the two languages are often spoken in different contexts. This overlap differs from child to child depending on the distribution and dynamics of the use of bilinguals' two languages in their environment. With age and maturation, bilinguals close this gap in their knowledge of language equivalents. They gain a concurrent knowledge of linguistic labels for all acquired concepts in both of their languages, as much as the vocabulary banks of each language allow. However, even mature and balanced bilingual individuals have a portion of their vocabulary limited to only one or the other language. The vocabulary overlap of these individuals may be substantial, but there are areas of specialized language use where one language is preferred over another. Therefore, it is essential to test both languages and assess the size of the vocabulary overlap whenever the size of vocabulary knowledge is evaluated for any bilingual individuals.

Limited cognitive capacity and access to input (Bialystok, 2001; Ben Zeev, 1977b) may play a more important role in explaining the acquisition of concepts associated with vocabulary than explaining the acquisition of the actual vocabulary tokens. In this study, findings associated with the Conceptual Vocabulary size of bilinguals support this idea. Acquiring a concept is a much more complicated task than learning an additional word associated with the concept. The limited cognitive processing capacities of young children may indeed cause young bilinguals not to acquire many more concept beyond what their monolingual peers are acquiring. This is reflected in the receptive conceptual vocabulary findings as bilingual and monolingual English groups recognized comparable numbers of concepts.

Lower productive Conceptual Vocabulary scores for bilinguals, when compared to their English monolingual peers reflect bilinguals' restricted ability to talk about different concepts, although they recognize a comparable number of concepts. Since bilinguals do encounter words and their associated meaning with lower frequencies than monolingual children would, it may take them longer to negotiate accurate linguistic production rules associated with a concept in each of their two languages. This would result in a smaller number of concepts that bilinguals feel comfortable producing. This limited usage disappears with time as the bilingual child is provided with additional linguistic input and opportunities to negotiate correct linguistic production associated with already known concepts.

The Spanish monolingual group demonstrated significantly lower knowledge of concepts as well as lower ability to produce concepts. This is most likely caused by limited Spanish linguistic input and interaction opportunities as described earlier. This further indicates that young Spanish monolinguals and children who are just beginning to acquire English as their second language are at the greatest risk of not only linguistic but also cognitive delays, specifically related to concept formation. In order to prevent future academic problems, these children need additional support, attention, and assistance which should be given during their preschool, kindergarten, and early elementary experience.

Taken as a whole, the above findings underscore the importance of testing both languages of bilinguals, while at the same time recognizing the existence of a vocabulary overlap. In addition, findings show that bilinguals have a vocabulary size advantage while their conceptual development is not delayed, revealing the benefits of bilingualism even during preschool years.

4. Conclusion

In spite of certain limitations caused by nonexperimental design and purposeful sample selection, the results of this study provide a clearer view of the developmental advantages from which bilinguals benefit. These results also allow greater confidence in claiming that simultaneous bilingualism is advantageous to a child's developing mind. While findings demonstrate clear differences in receptive vocabulary development supported by other research, further studies are needed to explore differences in productive vocabulary development.

The findings of this study are consistent with Cummins' (2000) threshold and interdependence hypotheses. These findings also support Bialystok's (2001) suggestions that bilinguals have a greater Total Vocabulary than monolinguals, while at the same time they are constrained by their cognitive capacities and do not surpass their age and developmental levels with regards to their conceptual development. This is shown in bilinguals' Conceptual Vocabulary, which is comparable to English monolinguals.

Indeed, it appears that being bilingual does not harm language or conceptual development. Balanced bilingualism, especially, brings benefits to bilingual children by allowing them access to two language communities, a richer linguistic environment, which positively affects their vocabulary and cognitive development. Understanding the benefits balanced bilinguals enjoy as a result of their exposure to two languages can assist early educators in developing appropriate curriculum for these children, supporting development in both languages. Additionally, educators and clinicians who determine the school readiness of bilingual children should be aware of the importance of testing both languages of bilinguals in order to assess true vocabulary knowledge of these children.

Understanding the risks associated with language and cognitive development of young Spanish monolingual children and children who are starting to acquire English as their second language can also assist early educators and clinicians in teaching, placement, and support. These children face problems in the form of possible delays in their language and conceptual development caused by being Spanish dominant in an English environment and require a different type of support than their more proficient bilingual peers. Spanish monolinguals often start learning a second language while their first language is being neglected or not properly developed. These children should be allowed to benefit from support of their first language both at home and at school, which would greatly limit difficulties they face later in their academic experience.

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