
Validity of a Parent-Report Measure of Vocabulary and Grammar for Spanish-Speaking Toddlers

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The validity of the Fundación MacArthur Inventario del Desarrollo de Habilidades Comunicativas: Palabras y Enunciados (IDHC:PE) was examined with twenty 20- and nineteen 28-month-old, typically developing, monolingual, Spanish-speaking children living in Mexico. One measure of vocabulary (number of words) and two measures of grammar (mean of the three longest utterances and grammatical complexity score) from the IDHC:PE were compared to behavioral measures of vocabulary (number of different words from a language sample and number of objects named in a confrontation naming task) and one behavioral measure of grammar (mean length of utterance from a language sample). Only vocabulary measures were assessed in the 20-month-olds because of floor effects on the grammar measures. Results indicated validity for assessing expressive vocabulary in 20-month-olds and expressive vocabulary and grammar in 28-month-olds.

KEY WORDS: parent report, language development, Spanish, vocabulary, grammar

Parent report has had an off-again on-again relationship with the field of developmental psycholinguistics. Over the last 10 years, with the development of new instruments (Fenson et al., 1993, 1994; Rescorla, 1989), the methodology has re-emerged and is being widely used for both clinical and research purposes. The usefulness of these instruments has spawned development of similar instruments in a number of other languages, including American Sign Language (Reilly, 1992), Chinese (Tardif, Gelman, & Xu, 1999; Wu, 1997), Dutch (Lejaegere, in process), Finnish (Lyytinen, Poikkeus, & Laakso, 1997; Lyytinen, Poikkeus, Leiwo, Ahonen, & Lyytinen, 1996), French (Poulin-Dubois, Graham, & Sippola, 1995), German (Grimm, Doil, Müller, & Wilde, 1996), Hebrew (Meital, Dromi, Sagi, & Bornstein, submitted), Icelandic (Thordardottir, 1996), Italian (Caselli & Casadio, 1995), Japanese (Ogura, Yamashita, Murase, & Dale, 1993), Korean (Pae, 1993), Spanish (Fernandez & Umbel, 1991; Jackson-Maldonado, Thal, Marchman, Bates, & Gutierrez-Ciellen, 1993), and Swedish (Berglund & Eriksson, 1996). For the United States and Mexico, one of the most important new inventories is the Fundación MacArthur Inventario del Desarrollo de Habilidades Comunicativas (Jackson-Maldonado, Bates, & Thal, 1992). In this paper we report the validity of parent report of vocabulary and grammar for 20- and 28-month-old children using the Palabras y

Enunciados form of this new inventory (referred to hereafter as the IDHC:PE). We also, like Dale (1991) and Thal, O'Hanlon, Clemmons, and Fralen (1999), attempt to determine whether parents of Spanish-speaking toddlers are able to differentiate between vocabulary and grammar or if they rely on some more general notion of language ability in providing information about their child's language abilities.

Jackson-Maldonado et al. (1993) point out that there are very few standardized measures of language for Spanish-speaking children younger than 3 years that include norms based on Spanish-speaking children. Thus, the new inventory will fill a long-standing need. However, using parent report to assess language is not without problems. As Dale, Bates, Reznick, and Morisset (1989) and Dale (1991) note, parents lack appropriate training to recognize early linguistic forms and they may be biased when reporting on the language development of their own child. Dale (1991) suggests, however, that these criticisms may be more closely related to the way in which parent report is elicited than to its true value. The number of studies in which the MacArthur Communicative Development Inventories (CDIs; Fenson et al., 1993) in particular have been used and the number of "sister" inventories developed for other languages suggests that the advantages of parent report outweigh the disadvantages. For example, in addition to ease of administration, parent report is cost effective. Perhaps more important, it provides a more representative sample of language than can be obtained through spontaneous interactions in the laboratory, school, or home at this early age. Parent report is also less influenced than laboratory data by such variables as word frequency in the language being sampled. Finally, parent report may be useful for such clinical tasks as evaluating the representativeness of a laboratory sample and monitoring specific linguistic changes that result from intervention.

Further support for the effectiveness of parent report is provided by three studies of English-speaking children using the MacArthur Communicative Development Inventory: Words and Sentences (CDI:WS), the English inventory designed to sample language in the same age range as the IDHC:PE. Dale et al. (1989) reported substantial and significant correlations between vocabulary scores on the CDI:WS and scores on a subset of vocabulary items on the Bayley Scales of Infant Development (Bayley, 1969) for four groups of 20-month-old children: typically developing, linguistically precocious, preterm, and full-term but at social risk. Correlations between the CDI:WS and expressive language subscores ranged from .43 to .63 (all significant at $p < .05$). Precocious children had the highest scores, followed by children who were developing typically, preterm, and at social risk, respectively. Correlations between the CDI:WS and receptive language subscores ranged from

.13 (ns) to .59. The lowest (and only nonsignificant) correlation was for the children who were preterm. Highest correlations were found for the typically developing children, with children who were linguistically precocious and those who were preterm following, in that order. Dale (1991) extended examination of CDI:WS validity to typically developing 24-month-old toddlers and to grammar in addition to vocabulary. He reported high and significant correlations between CDI:WS scores and a number of behavioral measures. The CDI:WS measures included vocabulary size, the mean of the three longest utterances, and the language complexity score. The behavioral measures included raw scores on the Expressive One Word Picture Vocabulary Test (EOWPVT; Gardner, 1981), the total number of different words in a spontaneous language sample, mean length of utterance (MLU) in the spontaneous language sample, and the Index of Productive Syntax (IPSyn; Scarborough, 1990). Because Dale was also interested in determining whether parents were able to differentiate between grammar and vocabulary as opposed to basing their reports on some more general notion of language ability, he calculated correlations within and across those two domains. The correlations ranged from .73 to .74 (all $p < .01$) for vocabulary to vocabulary, .74 to .79 (all $p < .01$) for grammar to grammar, and .54 to .78 (all $p < .05$) for vocabulary to grammar comparisons. Dale argued that parents were able to distinguish between vocabulary and grammar because the correlations within domains were higher than those between measures of vocabulary and grammar. Thal et al. (1999) examined the validity of the CDI:WS for children who were delayed in language and, thus, were typically older than the children in the norming group. They reported moderate-to-high significant correlations between CDI:WS scores and behavioral measures that included raw scores on the EOWPVT, number of different words and MLU from a spontaneous language sample, and the IPSyn. The correlations ranged from .78 to .86 (all $p < .01$) for vocabulary and .58 to .69 (all $p < .01$) for grammar. Unlike Dale, Thal et al. found that cross-domain correlations were as high or higher than within-domain correlations (.56 to .84; all $p < .01$), suggesting either that the parents in their study did not clearly differentiate between vocabulary and grammar or that grammar and vocabulary develop together to a remarkable degree during this period of development (Bates & Goodman, 1997a, 1997b).

The correlations between the parent report measures and both structured and naturalistic behavioral measures of language provide evidence of impressive validity for the CDI:WS. If similar levels of validity are demonstrated for the IDHC:PE, strong support for its value for measuring language development in Spanish-speaking toddlers will be provided. Unless the process of language acquisition is very different from that of

English or the parents of Spanish-speaking toddlers have very different observational abilities than parents of English-speaking toddlers, validity of the two forms should be similar. Preliminary support for validity of the vocabulary portion of the Spanish-language inventory has been provided by a study with an earlier version of the IDHC (Jackson-Maldonado, Thal, Bates, Marchman, & Gutierrez-Clellen, 1993). The version examined here is the final form on which normative data have been collected, and it includes measures of grammar as well as vocabulary. Given the major differences between English and Spanish grammar, it is especially interesting to determine whether parent report is a valid method of assessing grammar in Spanish-speaking toddlers and whether parents are able to differentiate between vocabulary and grammar. The highly inflected nature of Spanish could require more sophisticated linguistic training for accurate observation than the almost inflection-less grammar of English. On the other hand, the frequency of inflections in Spanish may create greater awareness in all speakers of the language. The relationship between lexical and grammatical skills is also important for exploring a current theoretical question: Are the lexicon and grammar separate modules, or do they develop from the same cognitive mechanism (see Elman et al., 1996, for a detailed discussion of this question).

Taking into consideration the effectiveness of the English and the Italian versions of the CDI, the penultimate form of the Spanish version used in the Jackson-Maldonado et al. (1993) study was developed with a similar structure. Two forms were designed: *Primeras palabras y gestos* (hereafter IDHC:PG) for children 8 to 16 months and *Palabras y enunciados* (IDHC:PE) for children between 15 and 28 months (Jackson-Maldonado et al., 1993). A majority of the 328 children who participated in the study were from Spanish-speaking families living in the southwest United States. The authors note, however, that approximately 10% of the participants were from families residing in Mexico. The study addressed a number of issues, one of which was a small study of the validity of the vocabulary section of the IDHC:PE. Specifically, Jackson-Maldonado et al. (1993) examined the relation between number of words produced as reported on the IDHC:PE and number of different words produced in a spontaneous language in 17 children whose ages spanned the range measured by the IDHC:PE. The correlation was 0.84 ($p < .0001$), suggesting high validity. The Jackson-Maldonado et al. study was considered preliminary because it (a) was based on the penultimate version of the IDHC:PE that had not been revised for the final to-be-normed version, (b) used a small number of participants whose ages spanned the full range of the inventory, and (c) only measured vocabulary. However, it established the validity of the basic methodology and provided the critical information

for final revisions of the IDHC:PE. Nonproductive items were discarded, and grammar sections were developed. Additionally, a more user-friendly form was created that could be scanned, and the age ranges were modified. The final IDHC:PG was designed to measure production of words and gestures and comprehension of words and common phrases in 8- to 18-month-old children. The final IDHC:PE focuses on word production and grammatical complexity in 16- to 30-month-old children. Based on the new forms, a norming study was completed on more than 1,500 children. Publication of the manual and norms (in preparation) are expected by the end of the year 2000. This final version was used in the present study.

Method

Participants

Participants were 39 typically developing, healthy children living in Querétaro or Mexico City, both of which are large, industrialized cities in central Mexico. All of these children also are part of the norming study mentioned above. Twenty of the children were 20 months old and nineteen were 28 months old. Mean age, number of males and females, and number of children who lived in each city are presented in Table 1. The children were from middle- to upper-middle-class families, as determined by parental occupation and education (see Table 2). A 10-point scale of occupation level and a 5-point scale of education level adapted from Mercer and Lewis (1977), Laosa (1980, 1982), and Riquelme and

Table 1. Participant age, number of each gender, and number living in each of the two cities in which the study was carried out.

Mean age in months;days (range)	Gender		City	
	Male	Female	Mexico City	Querétaro
20;17 (19;29-21;09)	8	12	10	10
28;10 (28;02-28;22)	12	7	9	10

Table 2. Parent occupation and education.

Level	Occupation		Level	Education	
	Mother	Father		Mother	Father
0-4 ^a	19	1	3	1	1
5-7	3	15	4	11	12
8-10	17	23	5	27	26

^aNineteen of the mothers were housewives, receiving a classification of zero. Given their education level and the occupation and education levels of their husbands, this appears to be an inaccurate reflection of their socioeconomic status.

Riquelme (1985) were used to classify the participants (see Appendix A). The majority of the parents were either well-educated housewives or professionals, as can be seen in Appendix A. Seventeen mothers and 23 fathers received occupational rankings of 8 to 10, indicating that they were university students, professionals, or business executives. Three mothers and 15 fathers received ranks of 5 to 7, indicating that they were skilled artisans, employees trained to deal with the public, or small business owners. Nineteen mothers and one father were ranked below 5, indicating that they worked in service industries or were housewives or house-husbands. All of the mothers in this category were housewives; the father was a laborer. Educational levels provide further evidence of the higher class standing of the families involved in this study. Twenty-seven mothers and 26 fathers (two thirds of the group) had at least some university education. Almost all of the others had some high school education. One mother and one father had only junior high school education as their terminal level.

A majority of the families involved in this study were monolingual Spanish-speaking. Three of the 20-month-olds and 4 of the 28-month-olds had some exposure to other languages through television, older siblings who went to bilingual schools, trips abroad, or the bilingual abilities of the parents. However, a condition for participation in the study was that Spanish was the primary language spoken to the child by all members of the family and that Spanish was the language used by all members of the family for communication within the family setting.

Procedures

Information about the language development of the participants was obtained through parent report (the IDHC:PE) and behavioral measures. In Querétaro the behavioral measures were administered at the research laboratory of the second author at the Autonomous University of Querétaro. In Mexico City they were administered in one of three places: a speech-language and hearing clinic (OIRA Educación, Psicología y Salud) at the University of the Americas, a daycare center near the same institution, or the child's home. Both the speech-language and hearing clinic and the daycare center were used for examining participants for a variety of experiments in addition to treating children with disabilities or providing daycare. Conditions for testing at the clinic were very similar to those in the laboratory at Querétaro; those at the daycare center had somewhat more noise and distraction. When children were seen in their homes, care was taken to establish conditions that were very similar to those in both laboratories. All participants in this study were typically developing toddlers, regardless of the site

at which they were tested. Ten of the 20-month-olds were tested in the research lab of the second author in Querétaro, 6 at home, 3 at the clinic lab, and 1 at the daycare center. Nine of the 28-month-olds were tested at the Querétaro lab, 7 at home, and 3 at the daycare center.

Potential participants were contacted through day care centers, nursery schools, public and private health care centers, sports activity centers, university administrative and academic personnel, university students and acquaintances of the second author, her students and research assistants. Contact was established through personal means rather than via public media such as advertisements in newspapers or magazines because personal contact is more culturally relevant in Mexico and with the Hispanic population (Trueba, 1987; Walker, 1987). Few Hispanic people respond to advertisements in the public media that request participation in research projects. For example, in a study using the IDHC in a Spanish-speaking population in Dallas, Texas, researchers got no responses from newspaper advertisements and had to resort to using personal contacts to obtain subjects (Marchman, personal communication, May 1999).

Participants were informed that they would be required to attend two experimental sessions, with no more than 2 weeks between them, in order to obtain all of the behavioral data. Each was given the IDHC:PE at the first visit or at the time of contact and asked to complete it and return it when they brought the child for behavioral testing (or when the examiner visited the home). The majority of the parents returned the IDHC:PE on the child's second visit, when the language samples were obtained. Some parents did not physically return the form on the second visit, although they reported that they had finished filling it out. When that happened, a research assistant picked it up at their home or day care center within the next few days. All of the parents reported that the form had been filled out no later than the date of the second behavioral testing session. At the first session, when they were given the IDHC: PE, a full explanation of the form was given to the parents. All the written instructions that appear on the IDHC:PE were read orally to the parents by the research assistants (RAs). The RAs also gave detailed examples of appropriate answers for each section, answered any questions that the parent might have, and requested examples from the parents so that they were sure that the instructions were understood. In all cases the IDHC:PE was filled out by one of the child's parents (usually the mother) rather than a grandparent or other caretaker.

Like the other language inventories developed from the model established by the CDI and a similar shorter

measure validated for English-speaking 2-year-olds (Rescorla, 1989), the IDHC:PE uses a recognition format. Part 1 of the IDHC:PE focuses on expressive vocabulary. It contains 680 words organized into 23 semantic categories. Each category has a list of words and parents are asked to indicate if their child uses those words. Vocabulary items included in the checklist were carefully chosen to be appropriate to Mexican Spanish and to words used by young Mexican Spanish-speaking children. The main sources were natural language samples from toddlers speaking Mexican Spanish and Spanish of Mexican origin spoken in the United States (Eisenberg, 1985; González, 1983; Gutiérrez, 1976; Jackson, 1989) and corpora from experiments at the University of the Americas in Mexico City (Jackson-Maldonado, unpublished). They were supplemented by vocabulary items from published Spanish-language and/or intelligence scales designed for older children (Test Vocabulario Imágenes Peabody [Dunn, Padilla, Lugo, & Dunn, 1986]; Batería de Evaluación Intelectual Kaufman [Kaufman, Kaufman, Gómez-Palacio, Rangel, & Padilla, 1987]; WISC-RM [Gómez Palacio, Padilla, & Roll, 1982]; Batería de Evaluación de la Lengua Española [Gómez Palacio, 1988]) and items from the English and Italian inventories that were determined to be culturally and linguistically appropriate. Almost all of the vocabulary items that are included in the final version of the IDHC:PE are the same as those in the penultimate version described by Jackson-Maldonado et al. (1993), where details of the culturally and linguistically specific modifications are described in detail. The final version, described in this paper and used for a large norming study (in preparation), was changed only slightly so that it would be more compatible in number of words with the Italian and English versions in order to make the IDHC:PE a better instrument for both cross-linguistic and monolingual studies. Specific instructions for this section are presented in Appendix B. Part 1 also includes five questions that provide information about whether the child talks about past and future events and about things that are not immediately present.

Part 2 uses the same recognition format to request information about verb conjugations and grammatical complexity. Next, parents are asked to indicate whether their child combines words or not. If the answer is yes, they are asked to complete two more sections, both of which have the same basic structure as the Italian and the English inventories. In the first (the only section of the IDHC:PE that does not use a recognition format), parents are requested to write down the three longest utterances that they have heard their child say recently (see Appendix B for specific instructions). The number of words in each utterance is counted and divided by 3 to obtain the mean of the three longest utterances (M3L). The final section contains a list of 37 pairs of phrases.

The top phrase is an example of a typical child utterance that lacks grammatical markers or is syntactically immature (e.g., *tuyo esto* [yours this], *puse a mano* [put in hand], *no toca, quemas* [no touch, you burn]); the second one is more grammatically complex (e.g., *Este es tuyo* [This is yours], *Lo puse en mi mano* [I put it in my hand], *No los toques porque te quemas* [Don't touch them because you'll burn yourself]). Specific instructions for completing this section are also provided in Appendix B. The examples of child utterances used for this section were taken from natural language samples from toddlers speaking Mexican Spanish. They included field notes, the dissertation, and research papers from the students of the second author (Jackson, 1989; Jackson-Maldonado, unpublished), data from Mexican children growing up in the United States (Kvaal, Shipstead-Cox, Nevitt, Hodson, & Launer, 1988; Maez, 1970, 1983), and relevant examples from the published Castilian Spanish data of Hernández-Pina (1984). A range of utterances was examined from the samples, providing a list that included a variety of structures and word types. The specific examples used for the majority of the "immature" (called *toddler register* henceforth) phrases and many of the more grammatically sophisticated ones were chosen from this list. Some toddler register examples were used to generate more mature constructions using rules proposed by Maez, Kvaal, et al. and Hernández Pina. Similarly some toddler register exemplars were developed by simplifying more mature exemplars using the rules or examples in the above-mentioned studies as a guideline. For example, *No lo toques porque te quemas* was simplified to *No toca, quemas*. When this was done, similar (although not identical) toddler register utterances were present in the language samples, providing confidence that the forms that were created were not unrealistic. Care was taken to be certain that all of the toddler register exemplars were true combinations rather than successive single-word utterances.

The complexity of the more mature utterances covered a range of structures found in the unpublished samples used to construct the grammatical complexity section of the IDHC:PE and in published works by other authors (Hernández-Pina, 1984; López-Ornat, Fernández, Gallo, & Mariscal, 1994). An attempt was also made to group them into coherent sets. In items 1–10, the toddler register utterances could be described as telegraphic in nature or as violating adult word order patterns. The more complex forms contained the appropriate verb conjugation for the telegraphic form or canonical word order. In items 11–20, the toddler register forms contain very short phrases that lack appropriate function words. The more mature constructions contain the appropriate prepositions, clitics, and articles. In items 21–30, toddler register forms are simple phrases constructed of nouns and lacking predicates. The more mature forms

add a verb with an appropriate conjugation and add predicates with structures such as periphrastic verbal phrases, negative imperatives, and prepositional phrases. The structures represented in the more mature utterances were characteristic of children in the 18- to 36-month-old range as documented by Hernández-Pina (1984), Jackson (1989), Jackson-Maldonado (unpublished), and López-Ornat et al. (1994). It was important to include some utterances that are most commonly found between 30 and 36 months old, even though the IDHC:PE is designed for an upper limit of 30 months, so that sufficient variability to avoid ceiling effects would be maintained at the older ages. In this section, one point is given every time the second (more grammatically complex) version is marked to obtain a grammatical complexity score.

Two behavioral measures of spontaneous language (which were part of a larger study of the relation between language and nonlinguistic cognition) were administered for the study reported here. One was an object-naming task adapted from earlier studies (Bates, Thal, Whitesell, Fenson, & Oakes, 1989; Thal & Bates, 1988) and was designed specifically for Spanish-speaking children in this age range. In this task, 10 objects were presented to the child, one at the time. The child was allowed to play with each object for 30 s, and during that time he or she usually named it. If the child didn't name the object, the experimenter asked "What is that?" and waited for a response. The objects were chosen to represent concepts that occur frequently in early childhood. They were a hat, car, comb, spoon, flower, cup, airplane, baby doll, dog, and telephone. The names for all of these objects also appear on the IDHC:PE

The second measure of spontaneous language was a 35-min language sample that was divided into three segments. In the first segment, mother and child played for 15 min with a set of toys. At 20 months the toys included foods, plates, cups, utensils, cars, colored blocks, and a baby doll with crib and bottle. At 28 months a Fisher Price farm and farm animals were added. In the second segment the experimenter and child looked at age-appropriate books together for 10 min and the experimenter asked open-ended questions about the story in each book. In the third segment (also 10 min) the experimenter and child played together with another set of toys, which, at 20 months, included a comb and brush, a mirror and purse, farm animals, trucks, wooden blocks, tools, and puppets. At 28 months a Fisher Price house with dolls and furniture was added.

Carefully trained research assistants who were students of educational psychology or speech-language pathology gathered all data. Before collecting data the RAs underwent a rigorous training procedure in which they practiced on pilot subjects and then videotapes of their

sessions were reviewed by the second author. In addition, videotapes were sent to the first author who reviewed them and provided feedback. RAs began collecting behavioral data only after both of the authors agreed that they had appropriate levels of skill.

Data Reduction and Analysis

One measure of vocabulary (total number of words produced) and two measures of grammar (the mean of the three longest utterances and the grammatical complexity score) were obtained from the IDHC:PE. With the exception of the mean of the three longest utterances (M3L), the IDHC:PE forms are machine scorable, and the scores were obtained using an OpScan 5 scanner from National Computer Systems, Inc. M3L was calculated by native Spanish-speaking research assistants at the University of Querétaro by counting the total number of words in the three utterances listed and dividing by 3. These procedures are identical to those used for the Italian versions of the inventory and similar to those used for the English version (in which morphemes rather than words are counted).

The number of objects named in the confrontation-naming task provided one behavioral measure of vocabulary. This task was scored from videotape after administration; one point was given for every object named. Credit for naming an object was given if the child's production was clearly recognizable or approximated the adult word. Credit was also given if the child used a different word than a typical adult would use and the parent identified it as the word used by the child for that object. If there was any doubt about the production, a second coder listened to the tape and a decision was reached by consensus. This procedure was required rarely and only for the youngest group of children.

Trained research assistants at the University of Querétaro transcribed approximately 100 consecutive, fully intelligible utterances (or as many utterances as the child produced if there were fewer than 100) from the language samples of each child using the Child Language Analysis System (CLAN; MacWhinney & Snow, 1985, 1990; MacWhinney, 2000). The number of utterances in the samples from the 20-month-olds ranged from 49 to 112. For the 28-month-olds the range was 54 to 143. A second coder transcribed each language sample independently. When disagreements occurred, the two RAs reviewed them together and obtained a consensus. A third coder, the second author, resolved disagreements that the first two coders were unable to resolve. If she agreed with one of the two coders, then the agreed-upon utterance was retained. If she did not agree with either coder, the utterance was not used. For the 20-month-old children, the average percent agreement before

reviewing the disagreements was 74% (range: 58–95). For the 28-month-old children, mean agreement was 72% (range: 53–95) before reviewing the disagreements. After reviewing the disagreements, reliability increased substantially to a mean of 95% (range: 81–100) for the 20-month-olds and a mean of 96% (range: 91–100) for the 28-month-olds. For the 20-month-olds a mean of 4 utterances (range: 0–19) and for the 28-month-olds a mean of 4 utterances (range: 0–9) could not be agreed upon and were discarded. After elimination of the utterances on which agreement could not be reached, all children still had language samples of at least 48 utterances. The average number of utterances on which MLU was finally counted was 88 (range: 48–108) for the 20-month-olds and 101 (range: 54–143) for the 28-month-olds. The CLAN program (MacWhinney & Snow, 1985, 1990) calculated the number of different words and mean length of utterances in words (MLU) for each child.

Results and Discussion

First, summary statistics were derived for all of the IDHC:PE measures and compared descriptively to similar measures in other languages and to the new norms for the IDHC:PE¹ (Thal, Jackson-Maldonado, et al., in preparation). Then, each of the measures described above was entered into a correlation analysis. The 20-month-old and 28-month-old groups were analyzed separately.

Descriptive Statistics

Median and mean scores, and the standard deviation for each of the measures, are presented in Table 3. The IDHC:PE raw scores and the variability across children

¹Norms were obtained for 1,116 Spanish-speaking Mexican toddlers between 16 and 30 months old. There were 94 children at 20 months and 93 at 28 months old.

are compatible with results reported in other studies, across a number of languages (Caselli & Casadio, 1995; Fenson et al., 1993; Jackson-Maldonado et al., 1993; Meital et al., submitted; Ogura, 1993) and with the new Mexican Spanish norms (in preparation). It is important to note that wide variability is the most typical characteristic of language development in this age-range (see Fenson, et al., 1994, and/or Bates, Dale, & Thal, 1995, for a detailed discussion of individual differences in early language development). For example, on the MacArthur Communicative Development Inventory Words and Sentences (CDI:WS) the median number of words produced by girls at 20 months old was 181, but the range for those who fell between the 10th and 90th percentiles (rankings that are often used to describe the normal range) was 46 to 405. For boys the median was 121, but the 10th to 90th percentile range was 32 to 319. For girls, at age 28 months the median was 544, and the 10th to 90th percentile range was 259 to 640. For 28-month-old boys the median score was 464, and the 10th to 90th percentile range was 179 to 620. Table 3 indicates that the median number of words produced by the participants in this study (with scores collapsed across gender) was 204 at 20 months and 500 at 28 months. This is very similar to the median scores of 275 words at 20 months and 490 words at 28 months in the CDI:WS norms (Fenson et al., 1993). Comparable scores are also seen for sentence complexity. At 20 months Spanish validity study participants had a score of 0, and English CDI:WS norms participants had a score of 1. At 28 months the Spanish validity study participants had a score of 18, and the English CDI:WS norms participants had a score of 22. The number of words produced, M3L, and complexity scores were also within one standard deviation of the scores for children in the large norming study (in preparation) of children living in Mexico. Similar patterns of variability on all three measures were seen in the participants in this study and those from the CDI studies and the IDHC norming study (see the standard

Table 3. Median, mean, and standard deviation on the Fundación MacArthur Inventario del Desarrollo de Habilidades Comunicativas: Palabras y Enunciados (IDHC:PE) and behavioral measures of language for 20- and 28-month-old Spanish-speaking children.

	20-Month-Olds (n = 20)			28-Month-Olds (n = 19)		
	Median	Mean	SD	Median	Mean	SD
IDHC:PE						
Number of words	204.00	236.75	145.96	500.00	431.89	195.14
M3L	2.00	2.12	1.09	4.00	4.39	2.58
Complexity	0.00	3.00	6.53	18.00	17.55	15.55
Objects named	5.00	4.05	3.27	8.00	6.89	3.51
Language sample						
Number of different words	41.50	38.95	20.70	62.00	71.68	36.06
MLU	1.22	1.28	.24	1.74	2.04	.73

deviations in Table 3). These descriptive statistics underscore, yet again, both the similarity in average measures across children who speak different languages and also the similar wide variability in the early stages of language development that have been noted in many studies of early language development.

Vocabulary: Correlations of Parent Report and Behavioral Measures

Table 4 displays the Pearson's correlations between scores on the IDHC:PE and behavioral measures of language for all participants. All reported correlations were significant at $p < .05$ or less. For 20-month-old children, the number of words reported on the IDHC:PE was correlated moderately highly with both the confrontation naming task (.69) and the number of different words in the language sample (.66). These are higher than the correlation reported by Dale et al. (1989) for typically developing English-speaking 20-month-olds on similar measures of vocabulary. In that study, the correlation between CDI:WS vocabulary and number of items correct on an expressive language subscale of the Bayley Developmental Index (10 items on the Bayley that examine expressive language) was .54. Dale et al. (1989) did not report correlations between language samples and parent report. However, Bates, Bretherton, and Snyder (1988) report a high correlation at 20 months old (.83) using a very early version of the CDI and 2–3 hours of

spontaneous language. Although the correlation reported by Bates et al. is considerably higher than the correlation of .66 reported in this study, they used a longitudinal cohort, collected the parent report information via direct interview, and sampled language in the children's home as well as their lab. In our study, the sample was cross-sectional, parents filled out the inventory and returned it without being directly interviewed, samples were obtained in only one setting, and we had only 30 min of spontaneous language in the samples. Given these substantial methodological differences, it is remarkable how similar the results are. Taken together, the data suggest that parent report and the IDHC:PE have excellent validity for measuring vocabulary at 20 months old.

For 28-month-old children, the number of words reported on the IDHC:PE was correlated moderately highly with confrontation naming (.68) and moderately with the number of different words in the language sample (.56). These are comparable to, but somewhat lower than, the correlations between the CDI and behavioral measures of vocabulary reported by Dale (1991) for English-speaking 24-month-olds (.73 with the Expressive One Word Picture Vocabulary Test [EOWPVT] and .74 with number of different words in a language sample) and to those reported for 39- to 49-month-old language-delayed preschoolers by Thal et al., 1999 (.86 with the EOWPVT and .78 with number of different words in the language sample). Nonetheless, the correlations for the Spanish-speaking 28-month-olds are respectable and significant, indicating that the IDHC:PE is a valid measure of vocabulary at this age.

Table 4. Correlations between the Fundación MacArthur Inventario del Desarrollo de Habilidades Comunicativas: Palabras y Enunciados (IDHC:PE) and behavioral measures of language for 20- and 28-month-old Spanish-speaking children.

Behavioral measures	IDHC:PE measures		
	Number of words	M3L	Complexity
20-Month-Olds			
Objects named	.69 ^b	NA ^a	NA ^a
Language sample			
Number of different words	.66 ^c	NA ^a	NA ^a
MLU	NA ^a	NA ^a	NA ^a
28-Month-Olds			
Objects named	.68 ^b	.57 ^b	.64 ^b
Language sample			
Number of different words	.56 ^c	.79 ^b	.83 ^b
MLU	.64 ^b	.68 ^b	.88 ^b

^a NA indicates measures that are not applicable because floor effects prevent accurate statistical comparisons at that age.

^b $p < .01$

^c $p < .05$

Grammar: Correlations of Parent Report and Behavioral Measures

M3L and grammatical complexity scores were not available for approximately one third of the 20-month-old children because they were not yet combining words. In fact, the mean and standard deviation for mean length of utterance in the spontaneous language sample (Table 3) suggest that most of these children were just beginning to combine words, if they were combining at all. Thus, we made no comparisons between parent report and behavioral measures of grammar at that age. This, too, is compatible with results reported by Dale et al. (1989), who chose not to report any measures of grammar for the same reasons, and it is typical of the variation in language development at this age. In future studies it will be useful to obtain data on larger samples of children so that there will be a large-enough number of 20-month-olds who are combining to allow validation analyses of that subgroup. Because we did not have a large-enough sample to do that, we evaluated only vocabulary at 20 months old.

At 28 months correlations between IDHC:PE M3L and language-sample MLU and between IDHC:PE grammatical complexity and language-sample MLU were moderately high and high (.68 and .88, respectively; see Table 4). Like the correlations for measures of vocabulary, our results are comparable to correlations for English-speaking 24-month-olds reported by Dale (1991). In that study the correlation between CDI M3L and language sample MLU was .74, CDI complexity score and language sample MLU was .76, CDI M3L and scores on the Index of Productive Syntax (IPSyn, Scarborough, 1990) was .79, and CDI complexity and IPSyn was .78. Similar results were reported by Thal et al. (1999): .68 for CDI M3L to MLU, .69 for CDI complexity score to MLU, .58 for CDI M3L to IPSyn score, and .67 for CDI complexity score to IPSyn. These results, then, demonstrate the validity of the IDHC measures of grammar at 28 months old and the comparability of summary data from Spanish- and English-speaking parents.

Differentiation of Vocabulary and Grammar

There are two ways in which one may determine if parents are capable of differentiating between vocabulary and grammar using a measure like the CDI or the IDHC:PE. One is if the validity of the parent reports of both grammar and vocabulary are high. This is the case for the Spanish-speaking 28-month-olds, as it was with the two studies in which parent report of grammar and vocabulary using the CDI were compared (Dale, 1991; Thal, O'Hanlon, et al, 1999). The second is if parent report scores of vocabulary correlate more strongly with behavioral measures of vocabulary than behavioral measures of grammar and parent report measures of grammar correlate more strongly with behavioral measures of grammar than with vocabulary.

A series of pairwise tests of correlations was carried out to determine if the observed correlations differed in predicted ways. These analyses were accomplished using the Fisher's z transformation, with p set at $<.05$. The correlations of interest appear in the last three columns of Table 4. These results show that behavioral measures of child vocabulary *were not* predicted better by IDHC:PE number of words than by IDHC:PE measures of grammar. Specifically, the correlations of .57 and .64 for object naming (one behavioral measure of vocabulary) with the IDHC:PR grammar scores (M3L and complexity, respectively) were not significantly different from the correlation with IDHC:PE number of words (.68). The correlations of the other behavioral measure of vocabulary (number of different words in the language sample) with the IDHC:PE complexity score (.83) were significantly higher than the correlation of

.56 with IDHC:PE number of words. The correlation with M3L (.79) was also higher than that with the inventory number of words, but the difference did not reach significance. On the other hand, the behavioral measure of grammar (MLU) *was* predicted significantly better by the IDHC:PE complexity score ($r = .88$) than by IDHC:PE number of words ($r = .64$). The correlations between MLU and M3L (.68) and between MLU and IDHC:PE vocabulary, however, were not significantly different. Thus, the behavioral measure of grammar *was* predicted better by one of the parent report measures of grammar, but none of the other correlation comparisons met that criterion.

On the face of it, these results suggest that parents' ability to differentiate between vocabulary and grammar is present but incomplete, although the data in this study appear to be weaker than those reported by Dale (1991). That appearance is not entirely correct, however. A careful look at the Dale article reveals that the correlation between IPSyn scores and CDI vocabulary was just as high as the correlations with the CDI M3L and grammatical complexity score (.78, .79, and .78, respectively). Similarly, the correlation between the number of different words in the language sample and grammatical measures on the CDI (M3L and grammatical complexity score) was also just as high as the correlation with CDI vocabulary (.77, .71, and .74, respectively). Thus, parents' ability to differentiate between vocabulary and grammar was validated against only a subset of the behavioral measures in the Dale study, and that is similar to what we report here. Another factor to consider is that neither the Dale nor the Thal et al. (1999) study used a statistical test to measure differences between the correlations between their measures. We applied the Fisher's z transformation to both sets of data and found results that are very similar to those reported here. In the Dale study the CDI grammatical complexity score and M3L were both correlated significantly more highly with the IPSyn score than with the score on the Expressive One Word Picture Vocabulary Test. None of the other correlations differed significantly. In the Thal et al. study, CDI vocabulary correlated significantly more highly with the score on the Expressive One Word Picture Vocabulary Test, but it also did so with the IPSyn score. None of the other correlations differed significantly.

Based on the correlation comparisons reported above, for Spanish speakers described in this study and English speakers in the Dale (1991) and Thal et al. (1999) studies, we believe that English- and Spanish-speaking parents appear to have some ability to differentiate between vocabulary and grammar. If these levels of language were viewed as inseparable, the correlations should have been much more similar across all measures of vocabulary and grammar. Clearly, however, the

question that we asked is more complex than it appears on the surface. A number of additional issues will need to be addressed in future studies if we are to determine an answer to this question. Because the ability to differentiate between vocabulary and grammar is important for exploring the relation between grammar and lexicon, such an endeavor has a useful theoretical purpose. In addition, if the major characteristic of specific language impairment is difficulty using grammatical aspects of language, then the answer to this question is important for determining how useful an instrument like the IDHC may be in helping to identify those children.

Dale suggested that the partial ability of English-speaking parents to separate the domains of grammar and vocabulary might reflect limitations on the reliability and validity of the behavioral measures as much (or more) than parents' inability to separate them. He was referring to the standardized tests that he used; however the structure of the CDI could also contribute to the overlap. In fact, in a study using a much earlier version of the CDI, Bates et al. (1988) removed the inventory vocabulary score from the factor analyses that they carried out because it correlated so highly with all of the other measures that "the matrix could not be inverted and no orthogonal factors could be found" (p. 214). That is even more likely to be the case in this study because both MLU and M3L were calculated using words rather than morphemes. Thus, our behavioral measure of grammar, and one of our parent-report measures of grammar, is closely tied to vocabulary size.

If the structure of the inventories were the sole reason for the overlap found in parent report of vocabulary and grammar, that overlap should be specific to the inventories. That is clearly not the case. The same patterns of correlation between measures of grammar and vocabulary are seen in the behavioral measures as well. For example, in the present study the number of different words in the language sample was significantly more highly correlated with MLU (a purported measure of grammar) than it was with the number of objects named in the confrontation-naming task (another measure of vocabulary). Similarly, in the Bates et al. (1988) study mentioned above, the language-sample vocabulary score created the same problem for the factor analysis as the parent-report score, and it also had to be removed from the factor analysis. The correspondence between the patterns of relations between vocabulary and grammar in what the parents report and the patterns seen in the behavioral measures provide support for studies that have furnished evidence of particularly close ties between grammar and the lexicon in English-speaking children at this developmental level (Bates et al., 1988; Bates & Goodman, 1997a, 1997b). These studies have been interpreted as demonstrating close ties between grammar and the lexicon. The ramifications of this interpretation

for both theory and intervention are significant, making more detailed and thoughtful studies of this question imperative.

Summary and Conclusions

This study was designed to explore two issues: (1) whether parent report is a valid method of assessing vocabulary and grammar in Spanish-speaking toddlers, and (2) whether parents of Spanish-speaking toddlers are able to differentiate between vocabulary and grammar. The results provide strong evidence of the validity of the IDHC:PE for measuring vocabulary in 20- and 28-month-old Spanish-speaking children from middle-class families and for measuring grammar in 28-month-old children. Support for parental ability to differentiate between vocabulary and grammar was equivocal, suggesting that additional ways to tease apart knowledge of the two domains may be needed.

The summary-level validity of the IDHC:PE was established in this study for children from homes in which the majority of parents had at least a high school education. Researchers and clinicians must exercise more caution when using the IDHC:PE for other purposes or with other populations until the validity for such purposes has been established. Fenson et al. (1993) suggest using the CDI for evaluating language-delayed toddlers and even for developing an initial idea of the vocabulary that might be incorporated into treatment. However, they specifically note that the CDI should always be used with additional measures, especially if the purpose is to make choices for clinical intervention. Yoder, Warren, and Biggar (1997) make a similar point in a study of summary-level and item-by-item stability of the CDI: Words and Sentences. They found that the summary stability was good and that the item-by-item stability was reasonable for research purposes for nouns, games and routines, and action words. Item-by-item stability was much too low, however, for clinical purposes. The same cautions must be applied to use of the IDHC:PE.

Similarly, the results from this study must not be generalized to children being raised in families with lower socioeconomic status (SES) until there are validation studies for that population. Behavioral studies of English-speaking families in the United States clearly demonstrate lower levels of language skills in children from low-SES families (Hart & Risley, 1995), and a recent study using the CDI:WS also reported scores well below the norms for children from low-SES families (Arriaga, Fenson, Cronin, & Pethick, 1998). These lower scores likely reflect the children's lower levels of language rather than the parent's inability to report accurately. Jackson-Maldonado et al. (1993) reported no significant

effects of maternal education or other demographic variables for Spanish-speaking toddlers. However, the education levels of the mothers in that study were equally split (1/3 each) among elementary or junior high school, high school or technical school, and university or graduate school. Because none of the mothers were illiterate or lacking in any formal education, generalization to a large portion of the Mexican population is not warranted until the appropriate validation studies are conducted.

Studies of the use of the IDHC:PE with bilingual children or children being raised monolingually during their early years, in a culture in which Spanish is not the dominant language, also need to be undertaken. Research using an earlier version of the IDHC:PE that was adapted for use with Cuban Spanish-speaking children and compared Spanish language performance to reported English language performance on the English CDI (Pearson & Fernandez, 1994; Pearson, Fernandez, Lewedag, & Oller, 1997; Pearson, Fernandez & Oller, 1995; Pearson, Fernandez, & Oller, 1993) suggests that parent report will be useful for such purposes. However, we must not ignore the variability in language exposure, dialectal differences in the Spanish spoken in different parts of the world, and the current level of understanding of bilingualism. For that reason, the IDHC:PE should be used with caution with children living outside of Mexico until further validation studies have been carried out and/or adaptations to other dialects of Spanish have been developed and validated. We believe that the study reported here and the large norming study of monolingual Spanish-speaking children from the interior of Mexico (in preparation), in combination with the English CDI norms, will form a much-needed foundation for future studies of early Spanish language development, Spanish-English bilingualism, and similarities and differences in monolingual development across the two languages.

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Appendix A. Occupation and education codes for the parents of the children evaluated using the Fundación MacArthur Inventario del Desarrollo de Habilidades Comunicativas.

Occupation Codes

- 0 Housewife or househusband
- 1 Maid, nanny
- 2 Service workers (salesperson, receptionist, waiter, butcher, chauffeur, seamstress)
- 3 Laborers (construction, plumber, gardener, farmers, auto mechanic)
- 4 Technicians, equipment operators
- 5 Carpenters and artists
- 6 Sales agents (travel agents, bank tellers, clerical)
- 7 Small business owners
- 8 University students
- 9 Professionals (doctors, lawyers, professors, teachers)
- 10 Large business owner or executive

Education Codes

- 1 No schooling
 - 2 Some primary school (grades 1–6)
 - 3 Some junior high school (grades 7–9)
 - 4 Some high school (grades 10–12)
 - 5 Some university level education
-

Appendix B (page 1 of 2). Instructions for completing the sections of the Fundación MacArthur Inventario del Desarrollo de Habilidades Comunicativas: Palabras y Enunciados used in this study.

Vocabulary Checklist

Los niños comprenden más palabras de las que dicen. Aquí nos interesa las palabras que realmente DICEN. Muchas veces, las palabras que usan son un poco distintas de las que aparecen en esta lista. Por ejemplo, dicen “pupa” en vez de “ombligo” o “pica” en vez de “chile.” También pronuncian las palabras de diferentes maneras; por ejemplo, dicen “tatamina” en vez de “vitamina” o “pato” en vez de “zapato.” Si su hijo dice otra palabra que se usa en su familia y que significa lo mismo que la que viene en el cuestionario (Por ejemplo, si dice “coca” en vez de “refresco,” “super” en vez de “tienda,” o “kleenex” en vez de “pañuelo”), rellene el círculo de la palabra correspondiente que viene en la lista.

Recuerde que la lista incluye las palabras que muchos niños pueden decir. No se preocupe si su hijo no dice todas las palabras.

Children understand many more words than they say. We are particularly interested in the words that your child SAYS. Often, the words that children use are a little different from those that are in this list. For example, they might say “pupa” instead of “ombligo” or “pica” instead of “chile.” They may also pronounce the words differently: for example, “tatamina” instead of “vitamina” or “pato” instead of “zapato.” If your child says another word that is used in your family and means

Appendix B (page 2 of 2). Instructions for completing the sections of the Fundación MacArthur Inventario del desarrollo de habilidades comunicativas: Palabras y Enunciados used in this study.

the same thing as one of the words in the questionnaire (for example, if he or she says "coca" instead of "refresco," "super" instead of "tienda," or "kleenex" instead of "pañuelo"), fill in the circle by the word in the list.

Remember that the list includes what is said by many children. Don't be concerned if your child doesn't say all of the words.)

Three Longest Utterances

Por favor escriba tres ejemplos de las frases más largas que requiera que su hijo haya dicho últimamente.

Please list three examples of the longest sentences that you have heard your child say recently.

Sentence Complexity

A continuación encontrará pares de frases. Por favor señale la que más se parezca a la forma como habla su hijo, en este momento. Si su hijo usa frases más largas o complicadas de las que vienen en los ejemplos, por favor marque la segunda frase. El niño no tiene que decir exactamente la misma frase, lo que le pedimos es que marque la frase que se parezca más a la manera en que su hijo habla.

Next you will find pairs of sentences. Please mark the one that sounds most like the way your child talks right now. If your child uses sentences that are longer or more complicated than the examples, please mark the second phrase. The child does not have to say exactly the same sentence as the example, we are asking that you mark the sentence sounds most like the way your child speaks.
