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IDENTIFIERS OF SPANISH-SPEAKING CHILDREN WITH LANGUAGE IMPAIRMENT WHO ARE LEARNING ENGLISH AS A SECOND LANGUAGE

by

María Adelaida Restrepo

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A Dissertation Submitted to the Faculty of the
DEPARTMENT OF SPEECH AND HEARING SCIENCES
In Partial Fulfillment of the Requirements
For the Degree of
DOCTOR OF PHILOSOPHY

In the Graduate College
THE UNIVERSITY OF ARIZONA

1995
As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Maria Adelaida Restrepo entitled "Identifiers of Spanish-speaking children with language impairment who are learning English as a second language." and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctorate of Philosophy.

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

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ACKNOWLEDGMENTS

I thank each of my committee members Drs. Theodore Glattke, Elena Plante, Muriel Saville-Troike, and Donna Johnson for their support during my doctoral study and for their respect for who I am. I also thank the teachers, staff, speech-language pathologists, principals, children, and parents that participated in this study from the Tucson Unified and Sunnyside School Districts; their help and participation made this study possible. I thank all the bilingual students that assisted me during the different stages of this study. They provided many free hours and enthusiasm that allowed me to complete this study in a timely manner. I thank Dr. Linda Swisher who provided a challenging and stimulating learning environment. She has been a great advocate and mentor during my studies.
DEDICATION

To Ron who provided me with emotional and financial support during this journey. To Natalia whose smiles and love prepare me for each new day.
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ABSTRACT

This study identified a set of measures that accurately and efficiently discriminated between predominantly Spanish-speaking children with normal language and with language impairment. Twenty-one 5- to 7-year-old children with normal language and 21 with language impairment, matched for age, gender, and school were studied. Each child responded to a set of verbal and nonverbal measures. The verbal measures assessed vocabulary and bound-morpheme learning skills, spontaneous language form, and responses to a standardized language test. The nonverbal measures assessed nonverbal intelligence, spatial-rotation, and motor-sequential skills. In addition, the children's parents participated in an interview to describe the child's current speech, language, and learning skills; and to report family history of speech, language, and academic problems.

The results of a stepwise discriminant analysis indicated that four measures accounted for 79% of the variance of the model (p < .0001). This four-measure discriminant model had a sensitivity of 91.3% and a specificity of 100%. The measures that contributed to the discriminant model were: parental report of the child's current speech, language, and learning problems; number of errors per terminable unit; family history of speech, language, or academic problems; and mean length of terminable unit. An additional discriminant analysis indicated that the same level of discriminant accuracy could be maintained with the two measures that accounted for the most variance in the
four-measure model: parental report of speech and language problems, and number of errors per terminable unit. Confirmatory discriminant analyses of the two-measure and four-measure models indicated that the results were stable across an independent sample. This study underscores the need for data-based approaches to the identification of Spanish-speaking children with language impairment, and the contributions of standard evaluations procedures to the identification of these children: parent interview and language-form analysis. In addition, the findings of this study indicate that a language-form deficit characterized by morphosyntactic difficulties and a high prevalence of family history of speech and language problems characterize children with language impairment regardless of the languages they speak.
CHAPTER I

Introduction

Children from Hispanic cultures form the largest group of second-language learners on the caseloads of speech-language pathologists (Roseberry-McKibbin & Eicholtz, 1994). Many of these children speak Spanish as their predominant language and are in the process of learning English as a second language (SS children). Public Law 94-142 requires that children in need of a communication assessment be evaluated in their predominant language. This mandate presents a challenge for school systems and speech-language pathologists who must evaluate SS children.

At present, there are limited resources available to evaluate SS children suspected of having a language impairment. There is a paucity of measures appropriately normed and validated for these children (Langdon, 1992; Kayser, 1995; Roseberry-McKibbin & Eicholtz, 1994), and a shortage of Spanish-speaking personnel trained to assess the language skills of SS children (e.g., ASHA, 1985; Langdon, 1992; Roseberry-McKibbin & Eicholtz, 1994). Moreover, there is a paucity of research describing normal language development in SS children (Schnell de Acedo, 1994) and the language skills of SS children with language impairment (LI) (Merino, 1983).

The challenge for clinicians is then to assess SS children accurately so that

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1 The current study focuses on predominantly Spanish-speaking children in the United States who are in the process of learning English as a second language. I will refer to these children as SS children. This term indicates that these children use Spanish more frequently than English, and are more proficient in Spanish than in English.
children with normal language (NL) are not identified as having an LI, and children with LI are not identified as having NL (Anderson, in press; Gutierrez-Clellen & Quinn, 1993; Kayser, 1989; Roseberry-McKibbin & Eicholtz; 1994; Westby, 1994). To prevent misclassification of SS children, it is necessary to identify measures that discriminate accurately between SS children with NL and SS children with LI. The current study addresses this need.

Chapter I describes the characteristics that have been found to differentiate groups of children with LI from groups of children with NL. It then describes the validity of measures used to help identify children with LI. Identifying the characteristics of children with LI will help determine target areas for measurement that are most likely to contribute to the accurate discrimination between SS children with NL and with LI. The discussion of the validity of measures will identify measures that have been found to discriminate accurately between English-speaking (ES) children with NL and with LI. These findings will be used to select and design measures that may also contribute to the discrimination between SS children with NL and with LI.

**Characteristics of Children with LI**

Leonard, Sabbadini, Leonard, and Volterra (1987) defined specific language impairment as a "significant language deficit in the face of normal nonverbal intelligence, adequate auditory acuity, and the absence of gross neurological disabilities" (p. 234). This exclusionary definition is well accepted, and according to Johnston (1988)
was introduced in the opening proceedings of the Institute on Childhood Aphasia in Stanford, 1960. I will refer to the children that meet Leonard et al.’s criteria as “children with LI”.

Research on ES children with LI indicates that these children demonstrate atypical cognitive and biological systems. Restrepo, Swisher, Plante, and Vance, (1992) found that the relations among selected indices of verbal- and nonverbal-cognitive skills differed between ES children with NL and with LI. This result indicates that the cognitive system of children with LI is qualitatively different from that of children with NL, rather than just delayed or low normal (cf. Leonard, 1987, 1991). In addition, Plante, Swisher, Vance, and Rapcsack (1991) found that children with LI demonstrate atypical brain configurations bilaterally. This finding provides an explanation for the presence of an atypical cognitive system in children with LI and their broad range of problems.

Verbal Characteristics

Language form. A disproportionate "language-form" deficit characterized by morphosyntactic problems is the hallmark of children with LI (e.g., Dromi, Leonard, & Shteiman, 1993; Lahey, 1988; Leonard, 1992; Leonard, Sabbadini, Leonard, & Volterra, 1987; Steckol & Leonard, 1979). For ES children, the morphosyntactic problems are characterized by a marked grammatical morphology deficit (e.g., Rice, Wexler, & Cleave, 1995; Steckol & Leonard, 1979); however, for children who speak languages that are more inflected than English, some authors have reported that the grammatical
morphology deficit is not as pronounced as in English (e.g., Dromi et al., 1993; Leonard, Bortolini, Caselli, & Sabbadini, 1993). For example, in Hebrew, inflections occur in both stressed and unstressed positions, whereas in English they occur in predominantly unstressed positions. Dromi et al. (1993) report that Hebrew-speaking children with LI demonstrate verb-inflection difficulties only in unstressed positions, and thus, the inflectional problem does not seem as pronounced as in English.

Children with LI use atypical syntactic structures and less complex sentences than mean-length-of-utterance-(MLU) matched controls\(^2\) (e.g., Grimm & Weinert, 1990; Hanson & Nettlebladt, 1995; Johnston & Kamhi, 1984). For instance, Johnston and Kamhi (1984) found that ES children with LI produced sentences with more grammatical errors and lower scores on verbs, interrogatives, and negatives on the Developmental Sentence Scoring (Lee, 1974) than controls. Research has also indicated that children with LI have difficulty understanding sentences with certain syntactic structures (e.g., Adams, 1990; Grimm & Weinert, 1990; van der Lely & Harris, 1990; Hsu, Angelloz, & Cairns, 1990). For instance, van der Lely and Harris (1990) found that ES children with LI had more difficulty comprehending reversible dative sentences than controls.

Few studies have addressed the language skills of SS children with LI. These studies have found that SS children with LI also seem to demonstrate a deficit in

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\(^2\)The term controls refers to children with NL that are either matched by age, mean length of utterance, or language age to children with LI of similar sociolinguistic backgrounds.
language form characterized by morphosyntactic problems. These problems involve errors of number, tense, person, and gender agreement, as well as omission and substitutions of pronouns, articles, and prepositions (Ambert, 1986; Juarez, 1983; Merino, 1983). For example, Merino (1983) used a test she developed to compare several morphosyntactic features in the language of 5- to 8-year-old SS children with severe LI and their controls. She found that the SS children with LI obtained significantly lower scores on their use of gender and number agreement, verb tenses, plurals, and pronouns than controls. She did not find group differences in the children's performance on the comprehension portion of the test. In addition, Juarez (1983) found that Spanish-English, bilingual children with LI also made significantly more errors on standardized Spanish and English tests of morphosyntactic skills than controls.

Reduced sentence complexity problems also seem to characterize the language-form deficit of SS children with LI. Linares-Orama and Sanders (1977) found that SS children with LI demonstrated significantly shorter MLU scores and significantly lower scores on the Developmental Assessment of Spanish Grammar (Toronto, 1976) (DASG) than controls. McKaig (1988) also compared the language skills of SS children with LI and controls. He used MLU, the DASG, and mean number of words per response analyses, and found no significant differences between groups; however, this finding may be the result of subject-selection problems in his study. McKaig used an

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3 The children in the Linares-Orama and Sanders study do not qualify as presenting specific language impairment because the authors did not rule out mental retardation and hearing problems.
unvalidated measure to classify children as having NL or LI with no additional criteria to support group classification.

Despite the fact that findings of a language-form deficit in ES children with LI appear to extend to SS children with LI, the results of the studies with SS children should be interpreted with caution. The studies’ research designs and statistical analyses are poor, and thus the results are questionable. Furthermore, problems across studies involve inadequate subject-selection criteria and minimal subject description.

Merino's (1983) study is an example of poor research design. She selected SS children in the United States with a measure she normed on monolingual Spanish-speaking children in Mexico. She then used the subject-selection measure to compare the SS children with LI with the controls. Significant differences in the results were therefore expected because the subjects were selected and classified based on their performance on the measure used to test for differences. Two studies by Juarez (1983) and Merino (1983) provide examples of poor use of statistical analyses. They performed multiple t-tests without alpha-slippage control. Significant results were therefore expected because lack of alpha-slippage control increases the probability that significant results are due to chance alone.

In summary, children with LI demonstrate a language-form deficit characterized by morphosyntactic problems. A marked grammatical morphology deficit characterizes ES children with LI (e.g., Leonard, 1994; Rice et al, 1995; Steckol &
Leonard, 1979); however, for children who speak languages that are more inflected than English the grammatical morphology deficit may not be as pronounced (e.g., Dromi et al., 1993; Lehecková, 1988; Leonard, Bortolini, Caselli, & McGregor, 1992). The few studies on SS children with LI suggest that these children also demonstrate a language-form deficit characterized by morphosyntactic problems (e.g., Juarez, 1983; Merino, 1983). Therefore, measures of language form may contribute to the discrimination between SS children with NL and with LI because they target morphosyntactic problems, the hallmark of children with LI (e.g., Leonard, 1994).

**Language-learning skills.** ES children with LI demonstrate problems learning novel vocabulary (e.g., Oetting, Rice, & Swank, 1995; Swisher & Snow, 1994). For example, Oetting et al. (1995) found that ES children with LI demonstrated significantly reduced incidental learning of novel words during a video-viewing task compared with controls. In addition, the children with LI had more difficulty learning novel verbs than nouns, whereas children with NL learned nouns and verbs equally well.

ES children with LI demonstrate deficits in generalization of bound morphemes to familiar words (Connell, 1987; Connell & Stone, 1992) and to novel words (Swisher, Restrepo, Plante, & Lowell, 1995). In addition, ES children with LI demonstrate bound-morpheme generalization deficits under a variety of treatment conditions. The children with LI have more difficulty generalizing bound morphemes than controls when clinicians model the affixed words (Connell, 1987; Connell & Stone,
1992); however, children with LI perform as well as controls when they are required to imitate the affixed forms. In addition, children with LI have more difficulty learning a bound morpheme when clinicians state the novel bound-morpheme rule than when they model the affixed forms (Swisher et al., 1995).

The limited research on language learning by SS children with LI indicates that they also have language-learning deficits. Roseberry and Connell (1991) used Connell's (1987) novel bound-morpheme learning paradigm with SS children with LI and controls. Roseberry and Connell trained the children with a learning task that used common English words and a novel bound morpheme that indicated part of an object. They then tested the children on the generalization of the bound morpheme to familiar English words. Roseberry and Connell found that the SS children with NL performed significantly better on the novel bound-morpheme generalization task than SS children with LI. In addition, they classified correctly 85% of the children in the study as having NL or LI based on the children's performance on the learning measure.

In summary, SS and ES children with LI are characterized by a deficit in novel bound-morpheme generalization (e.g., Roseberry & Connell, 1991; Swisher et al., 1995). Although vocabulary-learning problems have not been identified in SS children with LI, it is expected that they would have problems in this area as ES children with LI do (e.g., Oetting et al., 1995). Therefore, measures that target bound-morpheme and vocabulary-learning skills may contribute to the discrimination between SS children with
Language use. Brinton and Fujiki (1994) noted that language-form deficits affect language use in children with LI. Language use refers to functions of language (the purposes for which language is used), the context in which language occurs, and the language interactions between persons (Lahey, 1988). Although research on language use with ES children with LI is limited, Stockman (in press) found that an African-American child with LI used language for fewer functions than seven African-American children with NL. However, language-use problems may not independently characterize children with LI (Lahey, 1988). For example, language-use deficits seem to be present when children have either comprehension problems in addition to expressive-language problems (Craig & Evans, 1993; Craig & Washington, 1993), or when changes in language form are necessary to indicate a language function such as in speech style variation (Fey, Leonard, & Wilcox, 1981; Johnston, 1988).

Language-use research with SS children with LI is limited and the findings inconclusive. Damico, Oller, and Storey (1983) studied 10 Spanish/English, bilingual children referred for speech and language testing. They tested the predictive value of a language-use analysis and a language-form analysis on academic performance. Although they found that the language-use analysis differentiated those children that made significant academic gains from those that made minimal academic gains, the authors failed to identify which children had NL and which had LI.
A second study with SS children attempted to describe language-use deficits, in addition to other deficits, in SS children with LI. Ambert (1986) described the language skills of school-age SS children with LI identified by bilingual, speech-language pathologists. She concluded that the SS children with LI demonstrate language-use deficits; however, the deficits she described were problems with comprehension of questions. Thus, this finding may support the findings of Craig and Evans (1993) and Craig and Washington (1993) that pragmatic difficulties appear to be present mainly when children have language-comprehension problems.

In summary, language-use deficits seem to be present when ES and SS children with LI display comprehension problems. In addition, there is some evidence that language-use problems are present when changes in language form are necessary to express different language functions. Because there is no clear evidence that language-use problems independently characterize children with LI, language-use measures will not be used for the discrimination between SS children with NL and with LI.

Nonverbal Characteristics

To qualify as having an LI, children must demonstrate normal overall nonverbal intelligence (Leonard et al., 1987). They do so despite the presence of an atypical cognitive system (Restrepo et al., 1992) and deficits in specific nonverbal-cognitive skills. Relative to controls, children with LI demonstrate deficits in spatial-rotation skills (e.g., Johnston & Weismer, 1983; Kamhi, Catts, Mauer, Apel, & Gentry,
Perceptual skills (e.g., Tallal, Stark, Kallman, & Mellits, 1980), hypothesis-testing skills (e.g., Nelson, Kamhi, & Apel, 1987), analogical-reasoning skills (e.g., Nippold, Erskine, & Freed, 1988; Swisher, Plante, & Lowell, 1994), and motor-sequential skills (e.g., Johnston, Stark, Mellits, & Tallal, 1981; Swisher, et al., 1994). Paradoxically, children with so-called LI have deficits in both verbal and nonverbal-cognitive skills.

The conclusion that children with LI demonstrate an atypical cognitive system and the presence of specific nonverbal-cognitive deficits led researchers to examine the skills assessed with measures of nonverbal intelligence. Swisher et al. (1994) administered the Kaufman Assessment Battery for Children-Nonverbal Scale (Kaufman & Kaufman, 1983) (KABC-NVS), the Leiter International Performance Scale (Leiter, 1969), and the Matrix Analogies Test (Naglieri, 1985) to children with LI and their controls. Children with LI differed from controls in their performance on the three nonverbal intelligence measures and on some of the measures' subtests of analogical reasoning, spatial-rotation, and motor-sequential skills. These findings indicate that although ES children with LI demonstrate normal overall nonverbal intelligence, they are characterized by lower scores on nonverbal IQ measures than controls, which may be accounted for by specific nonverbal-cognitive deficits.

Authors have attempted to explain the co-occurrence of verbal and nonverbal deficits in children with LI. Some authors have developed cognitive explanations, while
others have developed biological explanations. Tallal (1990) hypothesized that the children's verbal and nonverbal difficulties are related to a temporal-sequencing problem across modalities (tactile, visual, and auditory); however, the temporal-sequencing theory does not account for the specific verbal and nonverbal deficits of children with LI such as a spatial-rotation deficit or bound-morpheme omission. Savich (1984) proposed that a deficit in symbolic representation accounted for deficits in spatial-rotation and language skills; however, if children with LI demonstrate a symbolic representation problem, they would have generalized verbal and nonverbal deficits, rather than specific deficits in such areas.

In contrast to these cognitive theories, Plante (1991) provided a biological explanation for the coexistence of verbal and nonverbal deficits in children with LI. She proposed that verbal and nonverbal deficits coexist in children with LI because they have atypical brain configurations in both left and right hemispheres. This explanation is compatible with the conclusion that children with LI have an atypical cognitive system characterized by verbal and nonverbal deficits (Restrepo et al., 1992; Swisher & Plante, 1993; Swisher et al., 1994), and accounts for the range of problems present in children with LI.

In summary, ES children with LI score significantly lower on measures of nonverbal intelligence. These lower scores can be accounted for by specific nonverbal-cognitive deficits. Although an extensive review of the literature revealed no research on
the nonverbal-cognitive skills of SS children with LI, I assume that SS children with LI demonstrate similar nonverbal-cognitive deficits to those of ES children with LI. If so, nonverbal measures of nonverbal intelligence, spatial rotation, analogical reasoning, and motor-sequential skills may contribute to the discrimination between SS children with NL and with LI.

**Family History of Language Problems**

There is considerable evidence from parental report that children with LI have a family history of language problems (e.g., Plante, 1991; Tallal, Ross, & Curtiss, 1989; Tomblin, 1989). Tallal et al. (1989) found that 77% of the children with LI in their study had a reported family history of speech, language, or academic problems in at least one first degree relative. In contrast, Tomblin (1989) found that only 53% of the children with LI had a reported family history of speech and language problems in at least one first-degree relative. The difference in the percentage of children with family history of speech and language problems between the two studies seems to be dependent on the criteria used for identifying history of language problems across studies. Tallal et al. (1989) asked parents questions about family history of speech and language problems, reading and writing problems, and grade retention. Tomblin (1989) asked questions about family history of speech and language problems only.

Plante (1991) found that seven of eight parents and four of five siblings that were scanned with magnetic resonance images demonstrated the atypical bilateral brain
configurations also found in children with LI (Plante et al., 1991). In addition, Plante (1991) found that most of these family members demonstrated either history of speech and language problems or were diagnosed with an LI. These findings indicate that parents and siblings of children with LI have a greater probability of atypical brain configurations and presence of speech and language problems than controls.

An extensive review of the literature revealed no evidence of family history of speech and language problems in SS children with LI. Nevertheless, I assume that SS children with LI are also characterized by a higher prevalence of speech and language problems in their families. This expectation is based on the evidence of family history of speech, language, or academic problems in ES children with LI (e.g., Tallal et al., 1989; Tomblin, 1989) and the findings of atypical brain configurations in the parents and siblings of ES children with LI (Plante, 1991). If so, a measure of family history of speech and language problems may contribute to the discrimination between SS children with NL and with LI.

Summary and Conclusions

Children with LI present with a set of verbal, nonverbal, and family history characteristics that differentiate them from controls. Children with LI demonstrate a language-form deficit characterized by morphosyntactic problems, the hallmark of children with LI (e.g., Leonard, 1994). In addition, ES children with LI also have a higher prevalence of family history of speech and language problems (e.g., Tallal et al.,
specific nonverbal-cognitive deficits, and lower scores on measures of nonverbal intelligence than controls (e.g., Swisher et al., 1994). I assume that SS children with LI also demonstrate these characteristics, and thus, measures of morphosyntactic skills, nonverbal intelligence, spatial rotation and motor-sequential skills, as well as, family history of speech and language problems may contribute to the discrimination between SS children with NL and with LI.

Language-learning measures may also help to identify children with LI. ES and SS children with LI demonstrate a novel bound-morpheme generalization deficit (e.g., Connell, 1987; Roseberry & Connell, 1991). In addition, studies have found that ES children with LI demonstrate a novel-vocabulary learning deficit (e.g., Oetting et al., 1995). I assume that SS children with LI demonstrate these language-learning characteristics. Therefore, measures of novel vocabulary learning and novel bound-morpheme generalization may contribute to the discrimination between SS children with NL and with LI.

Validity of Measures for Identification of Children with LI

Speech-language pathologists use a variety of measures to identify children with LI, such as norm-referenced language tests, spontaneous language analyses, case histories, and observation checklists of children in naturalistic contexts. To use these measures for identifying children with LI, they need to be valid for this purpose. At present, only a few measures are validated for the purpose of identifying ES children
with LI (e.g., Plante & Vance, 1994; 1995; Gavin, Klee, & Membrino, 1993; Rescorla, 1993) and no measures are validated for identifying SS children with LI (e.g., Langdon, 1992; Kayser, 1995).

Although there are several types of validity (e.g., construct, content, and criterion validity), concurrent validity refers to whether or not a measure accurately identifies the specific classification of subjects (Anastasi, 1988). Evidence of concurrent validity helps determine whether or not a test is valid for use in the identification of children with LI. The ability of a test to discriminate between children with NL and LI is one way to evaluate the concurrent validity of a measure for the identification of children with LI (Plante & Vance, 1994).

Discriminant accuracy indicates the percentage of children a measure correctly classifies into their original groups through a discriminant analysis procedure. Plante and Vance (1994) suggested that language tests that discriminate between children with NL and with LI with a discriminant accuracy above 90% can be considered "good" discriminators, and those that discriminate with an accuracy between 80% to 89% can be considered "fair" discriminators. They felt that tests with discriminant accuracy below 80% would have unacceptable rates of misclassification of children with NL and with LI. To ensure that SS children will not be misclassified at unacceptable rates, I will use the discriminant accuracy standard suggested by Plante and Vance (1994) in the pursuit of discriminators between SS children with NL and with LI. That is, I will require that
the measure or set of measures selected for identifying SS children with LI classify 80% or better of the SS children with NL and with LI into their original classifications.

**Discriminant Accuracy of Language Tests**

Although tests have long been used to help identify children with LI, some authors question the use of language tests for this purpose (e.g., Damico, 1992; Westby, 1994). Damico (1992) criticized the use of language tests to help determine whether or not children have an LI because the nature of standardized tests does not capture the nature of language. He pointed out that such tests only assess discrete aspects of language and do not reflect language as a whole. However, this criticism indicates that there is a mismatch between the purpose for which a test is valid and Damico's broader diagnostic purpose. If a test is valid for identifying children with LI, the examiner need not expect the test to describe the children's language skills as well (cf. McCauley & Swisher, 1984).

Westby (1994) also criticized the use of tests to identify children with LI because no test is free of cultural bias. That is, poor performance on a test may be due to the test's cultural bias and not to the child's actual skill level. Even if tests are culturally biased, a test could still be valid for the purpose of identifying children with LI in a specific population. It does not mean that the cultural and linguistic characteristic of the children being evaluated should not be considered. For example, if a norm-referenced test is validated for the purpose of identifying SS children with LI, then it should not be
used to identify children with LI from other cultural or linguistic backgrounds unless it is validated for use with these children.

The use of language tests to help identify ES children with LI has not been problem free. In 1984, McCauley and Swisher found that few speech and language tests met 10 psychometric criteria relevant to the use of tests for the identification of preschool children with speech and language problems. Ten years later, Plante and Vance (1994) concluded that there was little improvement in the psychometric quality of language tests. They found that few tests for preschool children met five or more of the 10 psychometric criteria that McCauley and Swisher employed in their review. Furthermore, Plante and Vance (1994) found that, of the tests that met five or more of the criteria, only one adequately discriminated between preschool children with NL and with LI (evidence of concurrent validity).

In two studies by Plante and Vance (1994, 1995), the Structured Photographic Expressive Language Test (Werner & Kresheck, 1983) consistently discriminated between preschool children with NL and with LI with a high level of accuracy. The test’s discriminant accuracy was above 90%; however, this accuracy was only obtained with a statistically derived cut-off score of -3.25 SD and not with the arbitrary cut-off scores frequently used by clinicians. These results demonstrate that to prevent misclassification of children, test developers must derive cut-off scores empirically to identify children with LI.
The use of tests to help identify SS children with LI has been especially problematic. Tests available to identify SS children with LI do not meet minimum psychometric criteria (e.g., Damico, 1992; Langdon, 1992; Kayser, 1995). No test developer has demonstrated that any test available to identify SS children with LI is valid for that purpose (Anderson, in press; Langdon, 1992; Roseberry-McKibbin & Eicholtz, 1994). In the absence of valid, norm-referenced tests to help identify SS children with LI, clinicians working with these children often use tests that are not appropriate for this population (cf. Anderson, in press; Ortiz, 1987; Wilkinson & Ortiz, 1986). For instance, Ortiz (1987) and Wilkinson and Ortiz (1986) studied the records of SS children identified as having an LI or a learning disability. They found that clinicians used test norms that were not appropriate for the children they were evaluating, and the clinicians failed to provide cautions on the interpretations of test results.

**Suggested alternatives to norm-referenced language tests for SS children.**

Authors have suggested that clinicians use test modifications and adaptations when they use tests that are not appropriately normed for the child under assessment, such as an SS child (Erickson & Iglesias, 1986; Evard & Sabers, 1979; Kayser, 1989, 1995; Taylor & Payne, 1983). Suggested modifications have included rewording test items, providing additional practice items, changing scoring criteria, or translating tests. However, these practices invalidate the norm-referenced interpretations provided with the tests. They also foster the false assumption that modified tests are culturally valid, and lead to the
inappropriate use of norm-referenced tests for descriptive rather than discriminative purposes. If tests are modified for use with SS children, the modified tests still must be validated to discriminate accurately between SS children with NL and with LI.

To solve the problem of utilizing tests with children for whom the tests are not appropriately normed, authors have also suggested that examiners obtain “local norms” on the tests (e.g., Carrow-Wolffolk, 1978; Evard & Sabers, 1979; Harris, 1985; Kayser, 1989). In contrast, other authors have criticized the use of local norms because local norms can lead to low expectations of the normed population. Furthermore, authors point out that local norms foster the use of tests inappropriate for the language variety of the children on whom the norms are obtained (Peña, Quinn, & Iglesias, 1992; Vaughn-Cooke, 1983; Westby, 1994). However, these criticisms do not address the issue that developing local norms alone does not validate a test for the purpose of identifying children with LI. Developers of local norms must further demonstrate that a test has high discriminant accuracy in order for the test to be valid for the purpose of identifying children with LI.

To counter problems with norm-referenced testing, authors have also suggested that an approach referred to as “dynamic assessment” be used to evaluate children for whom there are no norm-referenced measures (Kayser, 1987, 1995; Lidz & Peña, in press; Peña, Quinn, & Iglesias, 1992; Westby, 1994). Although there are several models of dynamic assessment, the basic process of dynamic assessment involves a
pretest-intervene-posttest paradigm (Anastasi, 1988; Bain & Olswang, 1995; Lidz & Peña, in press). The pretest and posttest portions involve either informal measures, observation of the child, or the use of norm-referenced tests (Lidz & Peña, in press). The intervention portion typically involves observation of the child’s learning potential through adult-child collaboration and progressive cuing (Bain & Olswang, 1995; Lidz & Peña, in press; Olswang, Bain, & Johnson, 1992).

Although dynamic assessment has several purposes, to use it for the purpose of identifying SS children with LI, investigators must demonstrate that the measures used with this approach have high discriminant accuracy. Peña et al. (1992) attempted to validate the use of dynamic assessment to identify SS children with LI. They found that SS children performed better on the Expressive One Word Picture Vocabulary Test (Gardner, 1979) if the children were previously trained to label items. Peña et al. categorized children as having NL or LI based on their performance on the intervention portion of the dynamic assessment and the second administration of the test; however, the children's classification as having NL or LI was not determined with criteria independent of the intervention and test performance. Thus, the discriminant accuracy of dynamic assessment using this test remains to be evaluated.

In summary, evidence in support of concurrent validity must be obtained in order to validate a measure for the purpose of identifying children with LI. One method of evaluating the concurrent validity of a measure is to determine the measure’s
discriminant accuracy through discriminant analysis (e.g., Plante & Vance, 1994, 1995). Although some norm-referenced tests have been validated for identifying ES children with LI with discriminant analyses, there are no norm-referenced tests that have been validated in this way for the purpose of identifying SS children with LI. Authors have suggested alternative approaches to identify children with LI for whom there are no appropriate norm-referenced measures, such as with SS children; however, the measures used with the alternative approaches still need to be validated for this purpose.

**Discriminant Accuracy of Spontaneous Language Analyses**

Clinicians frequently use spontaneous language analyses in the process of identifying ES children with LI (e.g., Swisher, 1994). Spontaneous language may be elicited or may be obtained in naturalistic contexts; the language analyses may be done on line through checklists or the language samples may be recorded and analyzed later. Language-form analyses are often used for identifying children with LI through the assessment of MLU, syntactic complexity, and morphological skills. Some language-form analyses include norms such as the Developmental Sentence Scoring (Lee, 1974); others include limited developmental information such as MLU (Miller, 1981).

Although clinicians often use language-form analyses to assist in the determination of whether or not a child has an LI (e.g., Leonard, Perozzi, Prutting, & Berkley, 1978; Leonard & Weiss, 1983), few language-form analyses have evidence of concurrent validity. The limited research demonstrating the discriminant accuracy of
spontaneous language-form analyses indicates that these analyses are useful for identification of ES children with LI. Gavin, Klee, and Membrino (1993) entered a set of indices derived from the language samples of 24 ES children with NL and 24 ES children with LI into a discriminant analysis. They found that a set of four variables (verb-phrase errors, number of single-word utterances, age, and number of three-element noun phrases) accurately discriminated 91% of the ES children with NL and with LI in their sample. The discriminant model was then validated on another sample of ES children with NL and with LI with a discriminant accuracy of 86%.

Gavin et al.’s (1993) findings suggest that language-form analyses, such as number of errors per total number of utterances, may discriminate between SS children with NL and with LI. Although Gavin et al. found that verb-phrase errors contributed significantly to the discrimination of preschool ES children with NL and with LI, an analysis of both verb-phrase and noun-phrase errors may be more appropriate for Spanish. Because Spanish is a more inflected language than English, Spanish agreement errors occur in the noun and verb phrases. Thus, both types of phrases may be affected in the language of SS children with LI.

Several authors have suggested that language-sample analyses be used to identify children with LI for whom there are no appropriate norm-referenced measures (e.g., Erickson & Iglesias, 1986; Erickson & Omark, 1981; Kayser, 1989; Leonard & Weiss, 1983; Mattes & Omark, 1984; Stockman, in press). For instance, Mattes and
Omark (1984) suggested that it is possible to differentiate children with NL from children with LI if the sample is compared "systematically" with the sample of other children in the community. Although a few studies have tested results of language-form analyses for significant differences between groups of SS children with NL and with LI (Linares-Orama & Sanders, 1977; McKaig, 1988), none has been evaluated for discriminant accuracy.

Despite this situation, some of the analyses described above may contribute to the discrimination between SS children with NL and with LI. For example, scores derived from the DASG and MLU analyses are possible candidates because they measure morphosyntactic skills, which target language-form deficits, the hallmark of children with LI. Of particular interest are Gavin et al.'s (1993) findings with ES children that suggest that an index of number of errors per utterance may also contribute to the discrimination between SS children with NL and with LI.

Other spontaneous-language analyses focus on language use, rather than form. The analysis of language use in naturalistic contexts is frequently advocated as an ecologically valid procedure for the assessment of children (e.g., Bernstein, 1989; Kayser, 1989; Langdon, 1992; Taylor & Payne, 1983; Westby, 1994). For this type of analysis, the clinician observes the child's language-use skills in a variety of contexts such as in the classroom, on the playground, or during lunch. The clinician determines how well the child communicates with different people during different activities.
(Bernstein, 1989). Although language-use analyses in naturalistic contexts may seem more ecologically valid to some clinicians, I decided not to use language-use measures because language-use deficits may not independently characterize children with LI. That is, language-use deficits only seem to characterize children with LI who have comprehension difficulties (e.g., Craig and Evans, 1993).

In summary, a spontaneous language-form analysis has been validated for the identification of ES children with LI (Gavin et al., 1993). In contrast, there is no spontaneous language analysis for identifying SS children with LI that has been evaluated for this purpose. Because language-form deficits are the hallmark of children with LI, language-form analyses that target morphosyntactic skills may help in the identification of SS children with LI. Analyses such as number of errors per utterance, MLU, and the DASG may contribute to the discrimination between SS children with NL and with LI.

**Discriminant Accuracy of Parental Report**

Clinicians frequently obtain case histories from parents to determine whether or not a child is at risk for LI. Case histories typically address the child’s past medical and developmental history, a parent’s description of the language problem, and family history of speech and language problems. Case histories can be obtained in written form, in interview form, or in a combination of both (e.g., Swisher, 1994). When evaluating children for whom there are no appropriately norm-referenced measures, it is particularly
important that clinicians interview parents in a systematic manner to obtain accurate information about the child's language (e.g., Holland & Forbes, 1986; Kayser, 1995; Mattes & Omark, 1984).

Few studies have looked at whether parental report contributes to the discrimination between children with NL and with LI. Rescorla (1993) reported on a series of validity studies on a parent survey that she developed for 1- and 2-year-old ES children, the Language Development Survey (Rescorla, 1989). She found that the measure's sensitivity (children with LI classified as LI) ranged from .75 to .90 and the specificity (children with NL classified as NL) ranged from .85 to .98. Although the specificity of this measure falls within the range of acceptable discriminant accuracy, the low end of the sensitivity range is unacceptable (cf. Plante & Vance, 1994).

Research has also demonstrated that parental report is an accurate source of information in describing a child's current language skills in both ES and SS children with NL (e.g., Dale, 1991; Gutierrez-Clellen, Palacios, & Thal, 1992; Hadley & Rice, 1993; Rescorla, 1993). For instance, Dale (1991) found that the MacArthur Communicative Development Inventory (Fenson et al., 1991) was an accurate measure of children's vocabulary, syntactic development, and nominal-pronominal usage when compared with norm-referenced tests and spontaneous language-sample analyses. The McArthur is a parental report that addresses ES children's current language skills. Dale (1991) found that the inventory's vocabulary portion was highly correlated with the
Expressive One Word Picture Vocabulary Test (Gardner, 1979) and Type-Token Ratio (r = .73 and .53, respectively). Dale (1991) also found that the inventory's syntactic portion was highly correlated with MLU and the Inventory of Productive Syntax (Scarborough, 1990) (r = .74 and .79, respectively).

With a Spanish version of the McArthur, Gutierrez-Clellen et al. (1992) analyzed the parents' report of SS children's current language skills through the Inventario del Desarrollo del las Habilidades Comunicativas Mac Arthur (Jackson-Maldonado, Marchman, Thal, Bates, & Gutierrez-Clellen, 1993). They found that parental report of the children's language skills was significantly higher than the skill levels obtained with spontaneous language samples elicited in the clinic. These results suggest that spontaneous language analyses may have underestimated skill levels because SS children are often reluctant to speak to strangers in clinical settings (Kayser & Restrepo, 1995).

In summary, there is evidence that parental report can discriminate between ES children with NL and with LI. There is no such evidence for parental report of SS children. Research findings on the parental report of ES and SS children with NL indicate that parents can describe accurately their children's current language skills. These findings suggest that a measure of parental report of the children's current language skills may contribute to the discrimination between SS children with NL and with LI.
Summary and Conclusions

Children with LI demonstrate a set of characteristics that differentiates them from children with NL. I assume that the presence of these characteristics is not dependent on the language the children speak, but on the nature of the disorder. Children with LI demonstrate a language-form deficit characterized by morphosyntactic problems, the hallmark of LI. Even though research describing the language deficits of SS children with LI is poor, it seems that SS children also demonstrate a language-form deficit characterized by morphosyntactic problems. In addition, ES and SS children with LI demonstrate a novel bound-morpheme generalization deficit. Other characteristics of children with LI have not been described in SS children; however, ES children with LI demonstrate a novel vocabulary-learning deficit, specific nonverbal-cognitive deficits, and a higher prevalence of family history of speech, language, and academic problems. I assume that SS children with LI demonstrate characteristics similar to those of ES children with LI, and expect that measures of these characteristics will contribute to the discrimination between SS children with NL and with LI.

Research on the discriminant accuracy of measures available to identify SS children with LI is not available. However, a few measures to identify ES children with LI have been evaluated for concurrent validity through discriminant analyses. Such measures have included a parental report of the children's current language skills (Rescorla, 1993), norm-referenced language tests (e.g., Plante & Vance, 1994), and a
language-form analysis (Gavin et al., 1993). The results of the concurrent validity studies with these measures suggest that similar measures designed to assess SS children may contribute to the discrimination between SS children with NL and with LI.

Because there are no measures validated to accurately identify SS children with LI, I considered a broad range of characteristics of children with LI and of measures to identify these children. This study will narrow the areas to incorporate in future research on the identification of these children, and provide the groundwork for such research. In addition, the results of this study will provide clinicians with data to make informed decisions on the selection of measures to assist them in the process of identifying SS children with LI.

In conclusion, I expect that measures that target the characteristics that differentiate groups of children with NL and with LI may contribute to the discrimination between SS children with NL and with LI. Such areas include novel vocabulary learning skills, novel bound-morpheme generalization skills, nonverbal intelligence, nonverbal-cognitive skills such as spatial rotation and motor sequencing, morphosyntactic skills, and family history of speech and language problems. In addition, I expect that measures similar to those that have discriminated between ES children with NL and with LI may also contribute to the discrimination between SS children with NL and with LI. Such measures include spontaneous language-form analysis, parental report of children’s current language skills, and standardized language tests.
Purpose of the Current Study

The purpose of the current study is to identify a set of measures that accurately and efficiently discriminates between 5- to 7-year-old SS children with NL and 5- to 7-year-old SS children with moderate and severe LI. An exploratory stepwise discriminant analysis will select the measures that most accurately and efficiently discriminate between the two groups of SS children. A confirmatory discriminant analysis will then determine whether the variables selected through the exploratory analysis accurately predict group membership on a second, independent sample of subjects.  

4 I attempted to extend Restrepo et al.'s 1992 findings that ES children with LI have an atypical cognitive system to SS children with LI. I used the same statistical analysis they used, a confirmatory factor analysis; however, because the covariance matrices were not positive definite, the confirmatory factor analysis did not run.
CHAPTER II

Method

Participants

Characteristics

Sixty-two SS children ages, 5:0 to 7:1 (years:months), were selected for study from preschool, kindergarten, and first-grade classes in which the primary language of instruction was Spanish. Forty-two children were boys and 20 were girls. The children were drawn from two school districts in Tucson, Arizona. Thirty-one SS children had a diagnosis of moderate to severe LI. They had a mean age of 6:1, with an age range of 5:0 to 7:1. Thirty-one SS children had NL skills. They had a mean age of 6:2, with an age range of 5:1 to 7:1. Children with LI were matched to children with NL according to age (+/- 3 months), gender, and school; when possible, children were also matched for classroom.

Selection Criteria

All SS children met the following criteria: (a) passed a pure-tone hearing screening (20 to 30 dB HL at 1000 Hz, 2000 Hz, and 4000 Hz and 25 to 35 dB HL at 500 Hz) (ANSI, 1969) on the day testing began; (b) scored within the normal range (score above -1.67 SD, IQ > 75) on the Kaufman - Assessment Battery for Children Nonverbal Scale (Kaufman & Kaufman, 1983) (KABC-NVS); and (c) spoke primarily Spanish at home and at school, as determined by classroom placement, the Home
Bilingual Usage Estimate (Skoczylas, 1971), and a teacher's questionnaire. One child was excluded because she did not pass the hearing screening. Three children were excluded because they received a composite IQ score < 75 on the KABC-NVS measure. No child was excluded by the language criteria.

All SS children with LI met the following additional criteria: (a) were identified by the school systems' ASHA-certified bilingual speech-language pathologists as having moderate to severe LI; (b) were enrolled in speech and language therapy with ASHA-certified, bilingual speech-language pathologists, or with noncertified, bilingual clinicians with at least 3 years experience providing speech and language services to SS children with LI; and (c) had no evidence of additional physical, developmental, or emotional disabilities as judged by the teacher and reported in the teacher questionnaire. Speech problems did not exclude the SS children with LI from the study. SS children with NL met the following additional criteria: (a) were enrolled in regular education classrooms; (b) were not enrolled in special education services; and (c) had no evidence of language, academic, physical, or behavioral problems as judged by the teachers and reported in the teachers' questionnaire.

Measures and Procedures

Determination of the Children's Predominant Language

Staff from the school districts' bilingual departments determined that the children in this study should attend bilingual classes. In addition, the staff determined
that Spanish should be the primary language of instruction for language arts. In order for
the children in this study to be placed in bilingual classes with Spanish-language arts
instruction rather than English-language arts instruction, the parents completed the
schools' registration form. The form asked three questions to determine whether the child
spoke or heard another language at home: (a) "What is the first language the child
learned to speak?", (b) "What is the language most often spoken by the student?", and (c)
"What is the language most often spoken at home, regardless of what the student
speaks?". If the response to any of the questions indicated that a language other than
English was used at home, a staff person from the school's bilingual department
evaluated the child. This person decided what the language of instruction and appropriate
classroom placement were for the child. The child had to score higher on the Spanish
portion than on the English portion of the Language Assessment Scale. (DeAvila &
Duncan, 1986) to attend a bilingual classroom with Spanish language arts instruction.

The Home Bilingual Usage Estimate (Skoczylas, 1971) is a questionnaire that
asks which language a child hears from and speaks to parents, siblings, aunts, uncles,
cousins, grandparents, and playmates (see Appendix A for a copy of this measure). In
this study, the child's parents were interviewed. The interviewer obtained a score for
each language. One point was assigned for the language each member of the family
spoke more frequently to the child, one for the language they spoke more frequently to
each other, and one for the language the child spoke more frequently. To qualify for
inclusion in this study, the Spanish score had to exceed the English score by at least 10 points. This score difference indicated that the child heard and spoke more Spanish at home. No child was disqualified by this measure.

The teacher questionnaire measured whether Spanish was the language the child used more frequently and more proficiently at school and at home (see Appendix B for a copy of this measure and scoring criteria). Proficiency in this study referred to how well the child spoke and understood each language. Frequency of use in this study referred to how often the child spoke or heard the language. The teacher rated each child's language for frequency of use and for proficiency of receptive and expressive language skills at home and at school; frequency of use and proficiency were rated separately, using a three-point scale for each. In order for the child to qualify for this study, the Spanish score had to exceed the English score by at least 10 points. A 10-point difference indicated that the child used Spanish as his or her primary language for communication, and that the child was more proficient in Spanish than in English. In addition to the language scoring in the questionnaire, the child’s bilingual teacher responded to four questions regarding whether or not there was any evidence that the child had physical, social, academic, learning, or language difficulties. No children were disqualified with this measure.

Scores on the Home Bilingual Usage Estimate (Skoczylas, 1971) and

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5 I obtained this information by interviewing the child’s teacher. Pilot work indicated that if I left the questionnaire for the teachers to complete, some would forget or lose the questionnaire.
teacher's questionnaire indicated that the children were predominantly Spanish speaking.

Table 1 shows the means and standard deviations of the participants' characteristics and scores on the language-use measures.

Table 1.

Means and Standard Deviations of Participants' Characteristics by Group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Children with NL</th>
<th>Children with LI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Age*</td>
<td>74.00</td>
<td>7.07</td>
</tr>
<tr>
<td>KABC-NVS</td>
<td>99.00</td>
<td>7.87</td>
</tr>
<tr>
<td>TQSP</td>
<td>65.09</td>
<td>3.61</td>
</tr>
<tr>
<td>TQEN</td>
<td>25.16</td>
<td>13.34</td>
</tr>
<tr>
<td>HBUESP</td>
<td>21.48</td>
<td>4.78</td>
</tr>
<tr>
<td>HBUEEN</td>
<td>3.90</td>
<td>3.92</td>
</tr>
</tbody>
</table>

Note. NL = normal language, LI = language impairment, KABC-NVS = Kaufman Assessment Battery for Children - Nonverbal Scale, TQSP = teacher questionnaire Spanish score, TQEN = teacher questionnaire English score, HBUESP = Home Bilingual Usage Estimate Spanish score, HBUEEN = Home Bilingual Usage Estimate English score.

* Age is provided in months.

Description of Candidate Discriminators

All the children selected for the study received a battery of verbal and nonverbal measures; their parents responded to a parent interview. Research assistants (RAs) conducted all testing and interviews in Spanish. Table 2 lists the measures the children and parents received.
Table 2.

**Measures for Analyses According to Domain**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Procedure</th>
<th>Measure for Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Verbal</strong></td>
<td>Learning Measures</td>
<td>NVL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NBMG</td>
</tr>
<tr>
<td></td>
<td>Spontaneous Language</td>
<td>MLTU</td>
</tr>
<tr>
<td></td>
<td>Analyses</td>
<td>DASG</td>
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<tr>
<td></td>
<td></td>
<td>NETU</td>
</tr>
<tr>
<td></td>
<td>Standardized Test</td>
<td>SSPELT-II</td>
</tr>
<tr>
<td><strong>Nonverbal</strong></td>
<td>Nonverbal IQ Measures</td>
<td>KABC-NVS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KABC-TRI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KABC-HM</td>
</tr>
<tr>
<td><strong>Family History</strong></td>
<td>Parent Interview</td>
<td>FHSLP</td>
</tr>
<tr>
<td><strong>Parent Report</strong></td>
<td>Parent Interview</td>
<td>PRSLP</td>
</tr>
</tbody>
</table>

*Note. NVL = novel vocabulary learning, NBMG = novel bound-morpheme generalization, MLTU = mean length of terminable unit, DASG = Developmental Assessment of Spanish Grammar, NETU = number of errors per terminable unit, SSPELT-II = Spanish Structured Photographic Expressive Language Test - II, KABC-NVS = Kaufman Assessment Battery for Children - Nonverbal Scale, KABC-TRI = Triangles subtest of the KABC, KABC-HM = Hand Movements subtest of the KABC, FHSLP = family history of speech and language problems, PRSLP = parent report of the child’s speech and language problems.*

**Verbal measures.** The verbal measures were obtained from spontaneous language samples, a standardized test, and language-learning tasks. An RA elicited the language samples in three different formats: picture description, interview with an adult, and story retelling. There were a total of eight pictures, which depicted several actions or events; the child selected four of the eight pictures. The RA turned the set of pictures face down and asked the child to take one picture at a time without showing it to her.
The RA then asked the child to tell a story about the picture as follows:

Tengo unos dibujos aquí para que tú los mires. Yo no sé que hay en los dibujos y no los voy a mirar. Coge un dibujo y no me lo muestres. Cuéntame un cuento sobre lo que está pasando en el dibujo. [I have some pictures here for you to look at. I do not know what is in the pictures and I am not going to look at them. Take a picture and do not show it to me. Tell me a story about what is happening in the picture.]

The purpose of the picture description format was to lead the child to assume that the RA did not know what was in the picture. Lack of listener knowledge about the topic being described fosters the speaker's use of more complex utterances (Masterson & Kamhi, 1991).

The interview with an adult format involved conversation between the child and the RA. The RA started the interview with the following statement: “Porque no sé nada de ti, quiero que hablemos un poco. Cuéntame de tu familia.” [Because I do not know anything about you, I want us to talk a little. Tell me about your family.] The RA used open-ended questions and encouraged the child to speak as freely as possible by following the child’s lead in the conversation. The RA used comments such as "Qué bien" [Very good], "Qué interesante" [How interesting], and "Cuéntame un poco más sobre eso." [Tell me a little bit more about that.] In addition to the opening statement, the RA introduced pre-selected topics for discussion: a scary experience or what the child
did on Halloween, favorite friends and activities at school, a hospital experience, descriptions of family members and pets, a trip to the zoo, and a favorite movie. The interview format was included because Evans and Craig (1992) found that this format led preschool children to produce more utterances with longer MLUs, as well as more advanced syntactic features, than a free-play format.

The story retelling format utilized two Mercer Myer "frog" books: *A Boy, a Dog, and a Frog* (Mercer, 1967) and *Frog Where Are You?* (Mercer, 1969). The RA told the story showing the child the pictures in the book. The RA asked the child to retell what was in the story by looking at the same pictures. Retelling was included in case there were children reluctant to speak spontaneously. The RA introduced the stories as follows:

Te voy a leer un cuento sobre un niño que se llama Martín, su perro Paco, y una rana. Yo te leo el cuento primero y después tú me lo cuentas. [I am going to read you a story about a child named Martin, his dog Paco, and a frog. I will read you the story first and then you tell it to me.]

The following language-form measures were obtained from the spontaneous language samples. The resulting scores of these language-form measures were used in the statistical analyses: DASG, which is a Spanish grammatical analysis; mean length of "terminable unit" (T-unit) named and developed by Hunt (1965) (MLTU), which is a sentence length measure; and a ratio of number of errors per total number of T-units
(NETU), which targets morphosyntactic errors. See Table 2 for a list of the languagesampling analyses.

For the MLTU measure, an RA segmented the sample into T-units. T-units that were all in Spanish were marked for analysis. T-units that had English in them were not considered for analysis unless the English word was commonly used in the children’s Spanish-language variety. Another RA counted and averaged the number of words per T-unit. Hunt (1965) defined an English T-unit as a main clause and its subordinate clauses (i.e., he went to bed even though he was not tired). The analysis of the samples in the current study followed Gutierrez-Clellen and Hofstetter’s (1994) adaptation of the T-unit analysis to Spanish. The difference between Hunt’s analysis and Gutierrez-Clellen and Hofstetter’s analysis is whether subjectless clauses (or pro-drop for Spanish) are counted as part of a T-unit or not. Hunt counts English subjectless clauses conjoined with a main clause as one T-unit. Gutierrez-Clellen and Hofstetter count these clauses as two T-units because Spanish is a pro-drop (pronoun or subject may be dropped from the sentence) language, it is more inflected than English, and carries subject information through verb suffixes. For example the sentence “El gato se fue y no volvió” [The cat left and did not come back] is two T-units in Gutierrez-Clellen and Hofstetter’s Spanish analysis and one T-unit in Hunt’s English analysis. MLTU was utilized in this study because Gutierrez-Clellen and Hofstetter found that MLTU is indicative of age differences in sentence complexity in school-age SS children with NL.
In addition, Schnell de Acedo (1994) suggested that mean length of response, such as MLTU, is more appropriate than MLU in the analysis of Spanish-language samples.

The DASG is an adaptation to Spanish of the Developmental Sentence Scoring analysis (Lee, 1974) for English sentences. The DASG assigns weighted scores to sentences based on developmental morphosyntactic hierarchies in six categories: (a) indefinite pronouns and noun modifiers, (b) personal pronouns, (c) primary verbs, (d) secondary verbs, (e) conjunctions, and (f) interrogative words. Three additional categories - possessives, plurals, and negatives - are taken into account within the above categories. An RA scored the sentences and averaged the scores. The norms were not used because they are not applicable to the population sample under study; they apply only to SS children in Illinois. The DASG procedure was followed according to the author’s guidelines, except for how utterances were segmented. In Toronto’s analysis, utterances can include two sentences conjoined with the conjunction “y” [and]. The utterances in this study were segmented into T-units as described above. T-units were used in this analysis because Toronto's definition of sentences matched that of T-units; however, Toronto's selection of two conjoined sentences as an utterance seemed arbitrary and not indicative of sentence complexity. Thus conjoined sentences were considered separate T-units.

The third spontaneous language-form analysis was NETU. In this analysis, an RA identified grammatical errors in each T-unit. Another RA added and averaged the
total number of grammatical errors per T-unit. The average score for each child was used in the statistical analyses. Agreement problems, use of inappropriate pronouns, word-order problems, and omission of forms were considered grammatical errors. Lexical errors, use of English words, codeswitching, phonological errors, and articulation errors were not included because the focus of the analysis was on morphosyntactic skills. In addition, cohesion errors across sentences were not counted in this analysis; only errors of agreement within a sentence were included. See Appendix C for a sample of morphosyntactic errors in a language sample.

The children received the Spanish Structure Photographic Expressive Language Test-II (SSPELT-II) (Werner & Kresheck, 1989), a standardized test without norms that measures expressive morphosyntactic skills in Spanish. The test assesses language by providing a photograph to the child and having the child complete a sentence, respond to a question, or describe the photograph. For example, the examiner shows the child a photograph of a boy ready to jump from a tree. The child is asked: "¿Está arriba, qué va a hacer?" [He is up, what is he going to do?]. The next picture shows the child up in the air and the child is asked: "¿Qué hizo el muchacho?" [What did the boy do?]. The RA reinforced the child for good attention and hard work, but did not provide feedback related to the accuracy of the responses on the test. For instance, the RA would say "Tú estás trabajando muy bien" [You are working really well], or "Tú estás haciendo un buen trabajo" [You are doing a good job]. The children's raw scores
were used in the statistical analyses. This test was selected because Plante and Vance (1994) found that the English version of the SSPELT-II was the only one in a battery of tests for preschool children that adequately discriminated between ES children with NL and with LI.

Two learning measures were developed to assess the child's novel vocabulary learning (NVL) and novel bound-morpheme generalization (NBMG). Both measures used single words rather than a story format because, during pilot work, SS children with NL did not learn novel vocabulary introduced through a story. The NVL measure was designed to teach three novel nouns corresponding to three novel objects depicted in line drawings on cards. The novel words were in consonant-vowel-consonant-vowel order to resemble a common word form in Spanish. Three Spanish-speaking university students from the local community judged the novel words not to be real words in the Spanish spoken locally. In addition, they judged the novel words to sound like Spanish (see Appendix D for the pictures of the nouns and names).

The NVL measure introduced the novel vocabulary through four different teaching modalities in the following order: modeling, imitation, identification, and naming. In the modeling modality, the RA modeled the names of the three novel objects as follows: "Este es un PEFO" [This is a PEFO]. The set of words was modeled twice. Then, in the imitation modality, the RA asked the child to repeat the names of the novel objects. The RA said to the child: "Este es un TIJO, di TIJO" [This is a TIJO, say TIJO].
The RA presented the set twice. Then, the RA placed the cards in random order in front of the child for the identification portion and asked the child to point to the novel object as follows: "¿Dónde está el DUCO?" [Where is the DUCO?]. After each presentation of the set of cards, the RA mixed the cards so the child would not learn the words in a specific order. This portion was finished when the child reached a criterion of pointing correctly to each noun three out of four consecutive times. After the child reached the criterion for each novel word, the child began the naming portion of the measure.

Only scores on the naming portion of the NVL were used for the statistical analyses of the study. The score on this measure indicated trials to criterion, and thus, the higher the number, the longer it took the child to name the words correctly. In this task, the RA asked the child to name each picture of the novel noun as follows: "¿Qué es esto?" [What is this?]. When the child reached a criterion of three out of four consecutive correct responses, the RA removed the noun-picture card from the set. The RA removed the card because pilot work indicated that, without removal, children had great difficulty learning the nouns; if the children only had to name two nouns, there was a ceiling effect. Thus, by removing the card of the noun learned, children had fewer nouns to focus on while attempting to learn the rest of them. Two children, one from each group, were not able to learn one noun in 20 trials. For these children, the RA removed two of the nouns, and introduced one noun at a time. Once the child learned one noun, the second noun was introduced, and then the third. The purpose of this last procedure was
to ensure that the child learned all the vocabulary to be used later in the generalization portion of the study.

The NBMG measure had two components: learning of the novel bound morpheme and generalization of the novel bound morpheme to newly learned novel nouns. The bound morpheme was /-ono/. When this morpheme was affixed to the noun, it indicated that only half of the object was represented. All the words, novel and common nouns, had two syllables with the last syllable ending in the vowel /o/. To facilitate learning and generalization of the bound morpheme within a day, only one vowel ending was used. The novel bound-morpheme task was modified from an English task that Connell (1987) developed, and which Roseberry and Connell (1991) subsequently used with SS children.

To introduce the bound morpheme, the RA first showed the child a set of nine line drawings that represented familiar objects, and asked the child to label the objects. If the child did not name any of the objects with the form expected, the RA provided the name of the noun to the child. After the RA presented the nine nouns, the RA showed the child the set of nine cards with the drawings of the whole object and half the object in each card. The RA asked the child to listen and then repeat the affixed nouns as follows: "Este es un CARRO. Este es un CARRONO. Di CARRONO" [This is a CAR. This is a CAR + ONO. Say CAR + ONO] (see Appendix D for a list of the stimuli).

Once the children finished imitating the affixed nouns, the RA asked the child
to choose four of the nine cards. If the child had failed to identify any of the nouns initially, they were not used in this task. The RA elicited the affixed noun as follows: "Este es un CARRO. Qué es esto? (CARRONO)" [This is a CAR. What is this? (CAR + ONO)]. The RA gave specific feedback regarding the accuracy of the response of the first two cards (e.g., Sí, es un CARRONO [Yes, it is a CAR + ONO]), and neutral feedback on the performance of the last two cards (e.g., OK). The specific feedback was phased out to familiarize the child with the procedures used with the novel bound-morpheme generalization task during which there was no specific feedback.

After the child finished affixing the novel bound morpheme to common nouns, the child began the generalization component of the NBMG task. The RA presented the pictures used during the NVL task to measure whether the child affixed the novel bound morpheme to these words. In addition, the RA also presented an additional novel word that was not presented during the NVL task, for a total of four words. Novel vocabulary words were used to control for differences in the children’s vocabulary knowledge. The RA presented the pictures in pairs, a picture of the whole object together with a picture of half of the object. The RA labeled the whole-object picture and asked the child to label the half-object picture as follows: "Esto es un DUCO. Adivina qué es esto (DUCONO)." [This is a DUCO. Guess what this is (DUCO + ONO)]. If the child did not respond after two elicitations, the RA presented a new card. After each card, the RA gave the child neutral feedback such as "OK." The RA presented the set of four cards
twice, for a total of eight possible correct responses. The number of correct responses for each child was used in the statistical analyses.

Children's phonological approximations of the stems and/or morphemes were considered correct. The correct stem with the correct bound morpheme, the correct stem with an approximation of the bound morpheme, and an approximation of the stem with the correct bound morpheme were considered correct responses. The use of a bare stem or a completely different stem with a correct bound morpheme were not considered correct responses. For example, for the expected word "DUONO", ducon/dacon/dacono/tudono were considered correct; tijono, tijote, ducote were not considered correct.

The RA rewarded the children for "good" behavior throughout the procedure with expressions such as "Estás escuchando muy bien" [You are listening well], or "Qué bien trabajas" [How well you work]. During the imitation, identification, naming, labeling of common objects, and the first two items of the bound-morpheme learning, the child received specific feedback regarding the accuracy of the response (e.g., "Sí, este es el NOUN "for a correct response; or "este es un NOUN" for an incorrect response). Feedback was neutral regarding accuracy of the response during the affixation of the last two common words and during the generalization component of the NBMG task. The RA said "OK" without giving the child feedback on whether the response was correct or incorrect. The neutral feedback was used to ensure that performance on the
task was based on the child's own application of the bound morpheme.

**Nonverbal measures.** The nonverbal measures were the full KABC-NVS and two of its subtests: triangles and hand movements. For 5-year-old children, the nonverbal scale includes the following subtests: triangles, hand-movements, spatial-memory, and face-recognition. For 6-year-old children, the nonverbal scale includes the subtests for 5-year-old children as well as the photo series subtest. The full nonverbal scale score, and the hand-movement and triangles subtests scores were entered into the statistical analyses (see Table 2).

The hand-movements subtest is designed to assess motor-sequential skills. Scores on this subtest have been found to be depressed in children with LI (e.g., Johnston, Stark, Mellits, & Tallal, 1981; Swisher, et al., 1994). Motor-sequential skills require that the child produce a series of refined fine-motor movement in a specific order. In this subtest, the child attempts to copy a series of hand positions in the same order in which the examiner presents them. The triangles subtest is designed to assess spatial-rotation skills, which have also been found to be depressed in children with LI (e.g., Savich, 1984; Kamhi, Catts, Mauer, Apel, & Gentry, 1988). Spatial-rotation skills require the child to imagine an object in a different orientation. In this subtest, the child looks at a picture of several triangles making a shape. The child has to reproduce the same shape with a set of triangles at a different orientation (flat on the table) from that of the picture (upright). The full nonverbal scale measure was used because Swisher et al.
(1994) found that the full nonverbal IQ scores were significantly lower in a group of children with LI than in a group of children with NL when the children received the KABC-NVS, the *Leiter International Performance Scale* (Leiter, 1969), and the *Matrix Analogies Test* (Naglieri, 1985).

Because the children in the current study were predominantly Spanish speaking, the RA gave the directions for the KABC-NVS in Spanish, as provided in the user’s manual. The test’s standard scores were used for the statistical analysis because the administration manual states that the nonverbal scale is appropriate to test children who do not speak or understand English (p. 40). In addition, a segment of the norming population was Hispanic. There were no apparent differences between the children’s Spanish language variety and that of the directions provided in the test manual.

**Parent interview.** The parent interview had two measures: family history of educational, speech, and language problems (FHSLP) and report of whether the child had educational, speech, or language problems (PRSLP) (see Appendix E for a copy of these measures). The FHSLP measure contained 21 questions addressing whether family members had a history of speech and language deficits, educational problems, learning or reading disabilities, attention deficits, or hyperactivity problems. The questionnaire asked about the history of these problems in the child’s siblings, parents, uncles, aunts, cousins, and grandparents. The questions were in a YES/NO format to facilitate the parents’ answers and the scoring process.
The PRSLP measure contained 29 questions that asked the parents whether they thought their child had problems with speech, expressive language, receptive language, learning, or attention in comparison with other children the same age. The questions were also in a YES/NO format. Most of the questions were phrased so that the answers for children with LI were "yes", while those for children with NL were "no."

The questions emphasized whether the child's current repertoire indicated that the child demonstrated specific speech, language, or learning problems. When a parent responded that the child used to have a problem, but did not demonstrate it anymore, the response was considered to indicate that the child did not have a problem at the time of the interview.

Four university students and two speech-language pathologists from the local community who spoke Spanish fluently checked the measures, protocols, and letters to the parents to ascertain that a Spanish variety of the local community was used. Although an attempt was made to have measures that used the Spanish variety of the local community, some children's Spanish varieties may not have been represented in the testing. No child's Spanish-language variety seemed to differ enough to warrant the child's disqualification from this study because of inability to follow the tasks due to language-variety differences. Thus, my subjective assessment is that there were no between group differences in the use of the local Spanish-language variety.
**General Procedures**

Table 2 lists the measures in which the children and the parents participated. The experimenter trained two RAs to administer the SSPELT-II, the learning measures, and the KABC-NVS. In addition, the RAs were trained to elicit and collect the language samples. Two additional RAs were trained to administer the parent interview. Six more RAs were trained to complete different aspects of the language analyses. Eight of the RAs were speech-language pathology and audiology undergraduate students at the University of Arizona; the other two RAs were graduate students in psychology and education. The RAs were blind to the purpose of the study and the classification of the children to control for testing bias. The RAs were proficient Spanish-English speakers; three of the RAs that conducted the tests or interviews reported that they grew up in bilingual homes in which the parents spoke Spanish at all times; the fourth, an interviewer, grew up in an Hispanic home and spoke Spanish with her grandparents.

A RA tested each child individually in a quiet place at the child's school. The experimenter observed 90% of the testing sessions to ensure that procedures were followed as described above and obtained reliability on approximately 20% of the measures. Each child received a hearing screening on the first day of testing. If the child passed the screening, the RA proceeded with the test battery. The testing took approximately 2 hours divided into at least two sessions, so that length of the sessions would not affect the child's performance on the measures. All testing was completed.
within a week for each child. Two children, one from each group, completed the testing in 2 weeks due to illness.

For the parent interview and the Home Bilingual Usage Estimate (Skoczylas, 1971), the interviewer contacted the parents and asked them to participate in the interview. The interviewer completed the measures at the child’s home or school. The interviewers conducted only four interviews in the schools; all others were conducted at the children’s homes. The parent interview took approximately one half-hour.

Counterbalancing

The tests and tasks were given in random order in an attempt to minimize a test-order effect. All the language sampling was done at the same time, but the formats were given in random order to minimize a format-order effect. The Mercer Myer books (1967, 1969) used for the language samples were counterbalanced across groups in an attempt to minimize a group effect. Each of the two RAs who evaluated the children tested half the children with NL and half with LI, in an attempt to minimize an RA-group effect.

Reliability

See Table 3 for a summary of the reliability for each measure, the transcription, and the T-unit segmentation by group. The reliability scores indicate the percentage of items on which the RA and I agreed across tests and learning measures. I scored on-line approximately 20% of the children’s tests and learning measures
independently for point-to-point reliability. To assess the reliability of the language samples' transcription, an RA randomly selected 5 minutes of 20% of the samples and retranscribed them. The reliability score indicates the percentage of transcribed words agreed upon between the two transcribers across samples. For the T-unit segmentation and NETU analyses, an RA reanalyzed 20% of the 5 minutes of the samples. The reliability score indicates the percentage of utterances agreed upon between the two RAs. For the DASG, an RA reanalyzed 50 consecutive T-units. The reliability score indicates the percentage of scoreable items agreed upon between the two RAs. For MLTU, an RA recounted the words on 20% of the samples. The reliability score indicates the number of utterances agreed upon between RAs. For the interview, a second RA scored the interview at the same time as the interviewer. The reliability score indicates the percentage of questions agreed upon across questionnaires between the RA and the interviewer.
Table 3

Point-to-Point Reliability on Each Measure, Transcription, and Terminable Unit Segmentation by Group

<table>
<thead>
<tr>
<th>Measure</th>
<th>Children with NL</th>
<th>Children with LI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVL</td>
<td>99.22%</td>
<td>99.44%</td>
</tr>
<tr>
<td>NBMG</td>
<td>99.04%</td>
<td>99.04%</td>
</tr>
<tr>
<td>MLTU</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>DASG</td>
<td>89.50%</td>
<td>84.86%</td>
</tr>
<tr>
<td>NETU</td>
<td>100.00%</td>
<td>95.23%</td>
</tr>
<tr>
<td>KABC-NVS</td>
<td>97.91%</td>
<td>97.91%</td>
</tr>
<tr>
<td>KABC-TRI</td>
<td>99.17%</td>
<td>100.00%</td>
</tr>
<tr>
<td>KABC-HM</td>
<td>99.49%</td>
<td>96.21%</td>
</tr>
<tr>
<td>PRSLP</td>
<td>98.85%</td>
<td>97.00%</td>
</tr>
<tr>
<td>FHSLP</td>
<td>99.57%</td>
<td>98.91%</td>
</tr>
<tr>
<td>SSPELT-II</td>
<td>99.00%</td>
<td>89.79%</td>
</tr>
<tr>
<td>Transcription</td>
<td>90.20%</td>
<td>85.77%</td>
</tr>
<tr>
<td>T-unit segmentation</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Note. NL = normal language, LI = language impairment, NVL = novel vocabulary learning, NBMG = novel bound-morpheme generalization, MLTU = mean length of terminable unit, DASG = Developmental Assessment of Spanish Grammar, NETU = number of errors per terminable unit, KABC-NVS = Kaufman Assessment Battery for Children-Nonverbal Scale, KABC-TRI = triangles subtest of the KABC-NVS, KABC-HM = hand-movements subtest of the KABC-NVS, PRSLP = parent report of the child's speech and language skills, FHSLP = family history of speech and language problems, SSPELT-II = Spanish Structured Photographic Expressive Language Test-II, T-unit = terminable unit.
CHAPTER III

Results

The purpose of the study was to identify a set of measures that accurately and efficiently discriminated between SS children with NL and SS children with LI. To address this purpose, exploratory discriminant analyses were run to identify the set of measures that most accurately and efficiently discriminated between the two groups of children. Confirmatory discriminant analyses were then run to validate the results on an independent sample from which the original discriminant function was derived.

An exploratory stepwise discriminant analysis was run using SAS 6.09 (1992). A stepwise discriminant analysis obtains a parsimonious model of discriminators by selecting the set of measures that best discriminates between groups. The program adds one measure at a time to a discriminant model. The criterion for a measure to remain in the model as a discriminator is based on whether or not the partial correlation of the measure with the class variable (group) adds significant variance. That is, the model selects a measure for inclusion when the statistical separation between the two groups on the measure is above chance. The program stops adding measures when no other measure contributes significant variance to the model.

The measures included in the stepwise discriminant analysis were the SS children's scores on SSPELT-II, KABC-NVS, KABC-TRI, KABC-HM, MLTU, NETU, DASG, PRSLP, FHSLP, NVL, and NBMG. Table 4 shows the means and standard
Table 4.
Means and Standard Deviations for Each Measure by Group

<table>
<thead>
<tr>
<th>Measure</th>
<th>Children with NL</th>
<th>Children with LI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>SSPELT-II</td>
<td>44.06</td>
<td>3.99</td>
</tr>
<tr>
<td>KABC-NVS</td>
<td>99.00</td>
<td>7.87</td>
</tr>
<tr>
<td>KABC-TRI</td>
<td>10.48</td>
<td>2.19</td>
</tr>
<tr>
<td>KABC-HM</td>
<td>9.45</td>
<td>2.00</td>
</tr>
<tr>
<td>PRSLP</td>
<td>4.71</td>
<td>2.76</td>
</tr>
<tr>
<td>FHSLP</td>
<td>9.93</td>
<td>7.34</td>
</tr>
<tr>
<td>NETU</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>MLTU</td>
<td>5.64</td>
<td>0.87</td>
</tr>
<tr>
<td>DASG</td>
<td>5.36</td>
<td>1.01</td>
</tr>
<tr>
<td>NVL</td>
<td>22.74</td>
<td>11.24</td>
</tr>
<tr>
<td>NBMG</td>
<td>4.35</td>
<td>3.32</td>
</tr>
</tbody>
</table>

Note. NL = normal language, LI = language impairment, SD = standard deviation, SSPELT-II = Spanish Structured Photographic Expressive Language Test-II, KABC-NVS = Kaufman Assessment Battery for Children Nonverbal Scale, KABC-TRI = triangles subtest from the KABC, KABC-HM = hand-movements subtest from the KABC, PRSLP = parent report of speech and language problems, FHSLP = family history of speech and language problems, NETU = number of errors per terminable unit, MLTU = mean length of terminable unit, DASG = Developmental Assessment of Spanish Grammar, NVL = novel vocabulary learning, NBMG = novel bound-morpheme generalization.
Exploratory Discriminant Analyses

The data set from 62 children was divided into two subsets. From the total pool of 62 children, the data of 23 matched pairs of children (46 children) were randomly selected (exploratory data set) and entered into the stepwise discriminant analysis. The data from the remaining eight matched pairs (16 children) (confirmatory data set) were used for the confirmatory analyses. The discriminant model derived from the exploratory data set indicated that a set of four measures best discriminated between the children with NL and with LI: PRSLP, NETU, MLTU, and FHSLP. Table 7 presents a summary of the measures and results of the stepwise discriminant analysis. The measures included are in the order of degree of variance contributed to the discriminant model.

In a discriminant analysis, statistical significance indicates that the amount of variance in the measures associated with group categorization is above chance levels. Statistical significance does not indicate that the measure accurately classifies the children (cf. Plante & Vance, 1994). In this study, discriminant accuracy indicates the number of children the analysis classifies into their original groups. Discriminant accuracy is described in terms of statistical sensitivity and specificity. Sensitivity refers to the percentage of children with LI that the analysis classifies as having an LI. Specificity refers to the percentage of children with NL that the analysis classifies as having NL.
Table 5.

Intercorrelations Between Measures for Children with Normal Language

<table>
<thead>
<tr>
<th></th>
<th>SPELT</th>
<th>KABC</th>
<th>TRI</th>
<th>HAND</th>
<th>PRSLP</th>
<th>FHSLP</th>
<th>MLTU</th>
<th>DASG</th>
<th>NETU</th>
<th>NVL</th>
<th>NBMG</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPELT</td>
<td>1.00</td>
<td>.20</td>
<td>-.05</td>
<td>.33</td>
<td>.11</td>
<td>.01</td>
<td>.37*</td>
<td>.25</td>
<td>-.06</td>
<td>.09</td>
<td>-.06</td>
</tr>
<tr>
<td>KABC</td>
<td>1.00</td>
<td></td>
<td>.57**</td>
<td>.43*</td>
<td>-.19</td>
<td>-.15</td>
<td>-.34</td>
<td>-.45**</td>
<td>-.22</td>
<td>-.28</td>
<td>-.24</td>
</tr>
<tr>
<td>TRI</td>
<td>1.00</td>
<td></td>
<td></td>
<td>-.03</td>
<td>-.17</td>
<td>-.08</td>
<td>-.23</td>
<td>-.22</td>
<td>-.31</td>
<td>-.10</td>
<td></td>
</tr>
<tr>
<td>HM</td>
<td>1.00</td>
<td></td>
<td>-.19</td>
<td>.03</td>
<td>-.14</td>
<td>-.23</td>
<td>-.08</td>
<td>-.07</td>
<td>-.38*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRSLP</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td>.68**</td>
<td>.43*</td>
<td>-.15</td>
<td>.05</td>
<td>-.01</td>
<td>-.07</td>
<td></td>
</tr>
<tr>
<td>FHSLP</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.43*</td>
<td>-.16</td>
<td>-.35</td>
<td>.04</td>
<td>-.22</td>
<td></td>
</tr>
<tr>
<td>MLTU</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.69**</td>
<td>.05</td>
<td>-.06</td>
<td>-.00</td>
<td></td>
</tr>
<tr>
<td>DASG</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.17</td>
<td>.18</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>NETU</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.11</td>
<td>-.12</td>
<td></td>
</tr>
<tr>
<td>NVL</td>
<td>1.00</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>-.22</td>
<td></td>
</tr>
<tr>
<td>NBMG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>1.00</td>
</tr>
</tbody>
</table>

Note. SPELT = Spanish Structured Photographic Expressive Language Test-II, KABC = Kaufman Assessment Battery for Children-Nonverbal Scale, TRI = triangles subtest from the KABC, HM = hand-movements subtest from the KABC, PRSLP = parent report of speech and language problems, FHSLP = family history of speech and language problems, MLTU = mean length of terminable unit, DASG = Developmental Assessment of Spanish Grammar, NETU = number of errors per terminable unit, NVL = novel vocabulary learning, and NBMG = novel bound-morpheme generalization.

*p < .05, **p < .01
Table 6.

Intercorrelations Between Measures for Children with Language Impairment

<table>
<thead>
<tr>
<th></th>
<th>SPELT</th>
<th>KABC</th>
<th>TRI</th>
<th>HAND</th>
<th>PRSLP</th>
<th>FHS LP</th>
<th>MLTU</th>
<th>DASG</th>
<th>NETU</th>
<th>NVL</th>
<th>NBMG</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPELT</td>
<td>1.00</td>
<td>.09</td>
<td>.17</td>
<td>-.19</td>
<td>.04</td>
<td>.25</td>
<td>.52**</td>
<td>.73**</td>
<td>-.55**</td>
<td>.19</td>
<td>.21</td>
</tr>
<tr>
<td>KABC</td>
<td>1.00</td>
<td>.73**</td>
<td>.73**</td>
<td>.25</td>
<td>-.11</td>
<td>-.07</td>
<td>-.12</td>
<td>-.09</td>
<td>.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRI</td>
<td>1.00</td>
<td>.43*</td>
<td>.36*</td>
<td>-.06</td>
<td>.05</td>
<td>.07</td>
<td>-.22</td>
<td>-.02</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HM</td>
<td>1.00</td>
<td>.31</td>
<td>-.27</td>
<td>-.20</td>
<td>.32</td>
<td>.02</td>
<td>-.17</td>
<td>.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRSLP</td>
<td>1.00</td>
<td>.06</td>
<td>-.13</td>
<td>-.04</td>
<td>-.13</td>
<td>-.01</td>
<td>-.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHSLP</td>
<td>1.00</td>
<td>.27</td>
<td>.16</td>
<td>-.17</td>
<td>-.20</td>
<td>.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLTU</td>
<td>1.00</td>
<td>.70**</td>
<td>-.12</td>
<td>.12</td>
<td>.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASG</td>
<td>1.00</td>
<td>.44*</td>
<td>.16</td>
<td>.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NETU</td>
<td>1.00</td>
<td>.18</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NVL</td>
<td>1.00</td>
<td>.22</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NBMG</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. SPELT = Spanish Structured Photographic Expressive Language Test-II, KABC = Kaufman Assessment Battery for Children-Nonverbal Scale, TRI = triangles subtest from the KABC, HM = hand-movements subtest from the KABC, PRSLP = parent report of speech and language problems, FHS LP = family history of speech and language problems, MLTU = mean length of terminable unit, DASG = Developmental Assessment of Spanish Grammar, NETU = number of errors per terminable unit, NVL = novel vocabulary learning, and NBMG = novel bound-morpheme generalization.

* p < .05, ** p < .01
The results of the stepwise discriminant analysis with the exploratory data set indicated that the total average squared canonical correlation was .79, which was statistically significant \((p > .0001)\). This indicates that the group discrimination between SS children with NL and with LI was above chance level using the four-measure model. The discriminant model in this study classified 21 of 23 children with LI as having an LI, indicating that the model has a sensitivity of 91.3%. The discriminant model also classified 23 of 23 children with NL as having NL, indicating that the model has a specificity of 100%. These findings indicate that the discriminant accuracy of the discriminant model was above 90%.

Table 7.

**Results of the Stepwise Discriminant Analysis.**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Individual Variance</th>
<th>Total Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRSLP</td>
<td>.57**</td>
<td>.57**</td>
</tr>
<tr>
<td>NETU</td>
<td>.15**</td>
<td>.72**</td>
</tr>
<tr>
<td>MLTU</td>
<td>.04*</td>
<td>.76*</td>
</tr>
<tr>
<td>FHSLP</td>
<td>.03*</td>
<td>.79*</td>
</tr>
</tbody>
</table>

*Note.* PRSLP = parent report of speech and language problems, NETU = number of error per terminable units, MLTU = mean length of terminable unit, FHSLP = family history of speech and language problems. *\(p < .05\), **\(p < .0001\).

A stepwise discriminant analysis procedure does not take into account the relations between the measures that have not yet been selected and those already selected.
by the model. Therefore, it is possible that an excluded measure might contribute to the
discriminant accuracy of the model. To test the remaining measures for their potential
contribution to the model's discriminant accuracy, the remaining measures were added
individually. The model was tested by removing the two measures that added the last 7% of
the variance: MLTU and FHSLP. This left the PRSLP and NETU, which together
accounted for 72% of the variance of the model. The remaining measures were then
added individually to the discriminant model to determine whether any of these
measures improved the discriminant accuracy of the model. Results of this procedure did
not improve the model's ability to discriminate between SS children with NL and with
LI. That is, no other combination of measures improved the level of discriminant
accuracy obtained with the four-measure discriminant model.

It is possible that the discriminant accuracy of the model can be maintained
with fewer than four measures. Accordingly, the first two measures (PRSLP, NETU),
which accounted for the most variance (72%), were entered into a discriminant analysis
to see whether the sensitivity and specificity of the four-measure model were maintained.
When PRSLP and NETU were entered, the discriminant accuracy remained; specificity
was 100% (percentage of children with NL classified as having NL) and sensitivity was
91.3% (percentage of children with LI classified as having an LI). These results indicate
that the same level of discriminant accuracy the four-measure model produced can be
maintained with the two-measure model. Therefore, the two-measure model is a more
efficient method to identify SS children with LI than the four-measure one. However, efficiency could not be improved with fewer than the two measures (PRSLP, NETU). When any one of the measures that contributed to the discriminant model was entered individually, discriminant accuracy decreased. That is, the sensitivity and specificity of the two- and four-measure models were not maintained.

**Confirmatory Discriminant Analyses**

Once the most accurate and efficient model to discriminate between SS children with NL and with LI was obtained, the discriminant model was validated with the remaining 16 subjects’ data (confirmatory data set). The purpose of the validation step was to determine whether the measures selected by the stepwise discriminant analysis accurately predicted group membership on a sample of subjects from which the discriminant function was not originally derived. This analysis was performed because stepwise discriminant analyses capitalize on sampling error. That is, the discriminant function is calculated to maximize discrimination between the subject groups sampled. Therefore, it is necessary to determine whether the discriminant model predicts group membership for subjects who are independent of the group from which the function was originally derived. This provides an estimate of the stability of the model across samples.

The results indicated that the four-measure discriminant model correctly classified seven of eight children with LI as having an LI (sensitivity of 87.5%) and eight of eight children with NL as having NL (specificity of 100%). This test was also run
with the two-measure discriminant model. Results indicated that the specificity and sensitivity were likewise maintained for the two-measure discriminant model across independent samples (100% and 87.5%, respectively). Table 8 provides the sensitivity and specificity of the models; Table 9 provides the sensitivity and specificity for each of the measures entered into the stepwise-discriminant analysis; Table 10 provides the weights and constants for the two-measure and four-measure discriminant models.

The discriminant function formulas of the discriminant models can be applied clinically to aid in the process of identifying SS children with NL and with LI. To use one of the two discriminant functions clinically, the child's score on each measure is multiplied by the weight indicated next to each measure in the formula. Then, all the measures' scores and the constant are added. A final score derived from the discriminant function above zero is consistent with performance of an SS child with LI; a score below zero is consistent with performance of an SS child with NL (see Appendix F for an example on how to use the discriminant functions).
Table 8.

**Sensitivity and Specificity of the Two Discriminant Models**

<table>
<thead>
<tr>
<th>Model</th>
<th>Exploratory Data Set</th>
<th>Confirmatory Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sensitivity</td>
<td>Specificity</td>
</tr>
<tr>
<td>PRSLP</td>
<td>91.3%</td>
<td>100%</td>
</tr>
<tr>
<td>NETU</td>
<td>(21/23)</td>
<td>(23/23)</td>
</tr>
<tr>
<td>PRSLP</td>
<td>91.3%</td>
<td>100%</td>
</tr>
<tr>
<td>NETU</td>
<td>(21/23)</td>
<td>(23/23)</td>
</tr>
<tr>
<td>MLTU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHSLP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. PRSLP = parent report of speech and language problems, NETU = number of errors per terminable unit, MLTU = mean length of terminable units, FHSLP = family history of speech and language problems.
Table 9.

**Sensitivity and Specificity of Each Measure**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSPELT-II</td>
<td>65.22% (15/23)</td>
<td>91.30% (21/23)</td>
</tr>
<tr>
<td>KABC-NVS</td>
<td>56.52% (13/23)</td>
<td>60.87% (14/23)</td>
</tr>
<tr>
<td>KABC-TRI</td>
<td>43.48% (10/23)</td>
<td>43.48% (10/23)</td>
</tr>
<tr>
<td>KABC-HM</td>
<td>60.87% (14/23)</td>
<td>65.22% (15/23)</td>
</tr>
<tr>
<td>PRSLP</td>
<td>73.91% (17/23)</td>
<td>95.65% (22/23)</td>
</tr>
<tr>
<td>FHSLP</td>
<td>73.91% (17/23)</td>
<td>91.30% (21/23)</td>
</tr>
<tr>
<td>MLTU</td>
<td>69.57% (16/23)</td>
<td>86.96% (20/23)</td>
</tr>
<tr>
<td>NETU</td>
<td>69.57% (16/23)</td>
<td>100% (23/23)</td>
</tr>
<tr>
<td>DASG</td>
<td>65.22% (15/23)</td>
<td>91.30% (21/23)</td>
</tr>
<tr>
<td>NVL</td>
<td>43.48% (10/23)</td>
<td>69.57% (16/23)</td>
</tr>
<tr>
<td>NBMG</td>
<td>65.22% (15/23)</td>
<td>60.87% (14/23)</td>
</tr>
</tbody>
</table>

**Note.** SSPELT-II = Spanish Structured Photographic Expressive Language Test-II, KABC-NVS = Kaufman Assessment Battery for Children Nonverbal Scale, KABC-TRI = triangles subtest from the KABC-NVS, KABC-HM = hand-movements subtest from the KABC-NVS, PRSLP = parent report of speech and language problems, FHSLP = family history of speech and language problems, MLTU = mean length of terminable unit, NETU = number of errors per terminable unit, DASG = Developmental Assessment of Spanish Grammar, NVL = novel vocabulary learning, NBMG = novel bound-morpheme generalization.
Table 10.

**Discriminant Functions for the Two- and Four-Measure Models**

<table>
<thead>
<tr>
<th>Model</th>
<th>Discriminant Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Four-Measure Model</strong></td>
<td>$\text{DF score} = -0.2084969 + \text{PRSLP}(0.1019379) + \text{NETU}(4.0810516) + \text{FHSLP}(0.0429730) + \text{MLTU}(-0.5324122)$</td>
</tr>
<tr>
<td><strong>Two-Measure Model</strong></td>
<td>$\text{DF score} = -2.6891650 + \text{PRSLP}(0.1447095) + \text{NETU}(4.3891402)$</td>
</tr>
</tbody>
</table>

*Note. DF = discriminant function, PRSLP = parent report of speech and language problems, NETU = number of error per terminable units, MLTU = mean length of terminable unit, FHSLP = family history of speech and language problems.*
CHAPTER IV

Discussion

The present study identified a set of measures that discriminated between SS children with NL and SS children with moderate to severe LI at a high level of accuracy. The results of a stepwise discriminant analysis indicated that four measures, PRSLP, NETU, MLTU, FHS LP, accounted for 79% of the variance in the statistical model (p. < .0001). The four-measure model discriminated between the two groups of children with a discriminant accuracy above 90%. It classified 21 of 23 SS children with LI as having an LI (sensitivity of 91.3%), and 23 of 23 SS children with NL as having NL (specificity of 100%). These results were then validated on a sample different from the one in which the discriminant functions were derived. The results of this analysis indicated that the four-measure model classified seven of eight SS children with LI as having an LI (sensitivity of 87.5%); and the model classified eight of eight SS children with NL as having NL (specificity of 100%).

To determine whether the high level of discriminant accuracy could be maintained with fewer than four measures, a discriminant model was tested with the two measures that accounted for the most variance of the four-measure model (72%): PRSLP and NETU. Results of the two-measure discriminant model maintained the discriminant accuracy in the exploratory and confirmatory data sets, thus maintaining the sensitivity and specificity of the four-measure model.
When more measures were added to the models, however, the 90% discriminant accuracy level was not maintained, and more children were misclassified. Only the two-measure (PRSLP and NETU) and the four-measure discriminant models (PRSLP, NETU, MLTU, FHSLP) in this study discriminated with an accuracy above 90%. In addition, the discriminant accuracy level fell below 90% when measures were tested individually for sensitivity and specificity. That is, one measure alone was not sufficient to discriminate with a high level of accuracy between the two groups.

The results of this study fall within the criterion for acceptable discriminant accuracy for identifying children with LI suggested by Plante and Vance (1994). They stated that "good" discriminant accuracy should be above 90%, and fair discriminant accuracy should be between 80% to 89%, for sensitivity and specificity. They felt that a rate of misidentification below an 80% level would have "serious social consequences" (p. 21) for children with NL identified as having an LI, or for children with LI identified as having NL.

Only two types of procedures were involved in the two-measure and in the four-measure models that discriminated with a high level of accuracy between the SS children with NL and with LI: parent interview and spontaneous language-form analysis. The parent interview procedure involved two measures that were analyzed separately: PRSLP and FHSLP. These two measures addressed parental report of the children's current speech, language, and academic skills and family history of speech, language,
and academic problems. The spontaneous language-form analysis procedure also involved two measures: NETU and MLTU. These two measures analyzed the children's morphosyntactic skills.

In the responses to the PRSLP measure, the parents of the SS children with LI reported that their children demonstrated problems in language, speech, or academic skills more frequently than the parents of the SS children with NL. The PRSLP contribution to the high discriminant accuracy of the models, however, must be interpreted with caution. The parents of the SS children with LI in this study already knew that their children were diagnosed with speech and language problems, and thus this knowledge may have influenced their responses. Future research needs to validate this measure as an identifier of SS children referred for language assessment who have not yet been identified as having an LI.

The results of the PRSLP suggest that parents are a valuable source of information for discriminating between SS children with NL and with LI. These results provide support for the recommendation that, in addition to obtaining case histories, clinicians should interview parents about their children's language skills in a systematic manner (e.g., Holland & Forbes, 1986; Kayser, 1995; Mattes & Omark, 1984). Parental report is especially important when assessing children for whom there are no appropriate norm-referenced measures because clinicians need to obtain an accurate description of the child's language in order to diagnose children correctly.
Although parental knowledge that their children had been diagnosed with LI may have influenced the PRSLP responses, several factors considered in the development of the questionnaire might have also contributed to the discriminant accuracy of the measure. The questions of the PRSLP measure focused on whether the speech, language, and learning behaviors were in the child's current repertoire. The results support the finding that parental report of the children's current language skills is accurate (Dale, Bates, Reznick, & Morisset, 1989). In addition, questions on the PRSLP addressed specific components of speech, language, or learning skills. For example, language questions asked about the child's agreement skills, ability to follow directions, and ability to retrieve words. Furthermore, some of the questions asked parents to compare their child's skills with those of children the same age. This type of question may have helped parents determine whether the child's behavior was normal or atypical in relation to the child's peers.

In the responses to the FHSLP measure, the other measure obtained from the parent interview, the parents of the SS children with LI reported that their children had family histories of academic, speech, and language problems more frequently than the parents of SS children with NL. Thus, the results on the FHSLP measure extend the findings of family history of speech and language problems in ES children with LI to SS children with LI (e.g., Plante, 1991; Tallal et al., 1989; Tomblin, 1989; Tomblin & Buckwalter, 1994). This finding indicates that an SS child with a family history of
speech and language problems is at greater risk for LI than one without such a history.

Researchers addressing prevalence of family history of speech and language problems or identifiers of SS children with LI may want to emphasize questions on academic skills rather than questions on speech or language therapy (cf. Tallal et al., 1989 with ES children). Several parents of the children in this study reported that there were no special-education services such as speech and language therapy where they went to school. Instead, these parents reported that they or family members had academic problems in school, or had problems learning to read, speak, or write.

The other type of procedure that contributed to the discrimination between SS children with NL and with LI involved spontaneous language-form analysis. Two measures used this procedure: NETU and MLTU. The NETU measure analyzed the number of morphosyntactic errors per TU, whereas the MLTU measure analyzed the number of words per TU.

According to the results of the NETU measure, the SS children with LI made more language-form errors than the SS children with NL. The results of the NETU measure indicate that a morphosyntactic deficit characterizes SS children with LI. This finding is compatible with Gavin et al.'s (1993) report that the number of verb-phrase errors per utterance accounted for the most variance in a discriminant model of language indices that discriminate between ES children with NL and with LI.

Research on SS children with LI should continue to identify the types of
language-form errors that characterize these children to increase the understanding of the nature of LI and to improve the identification process of SS children with LI. Because Spanish is a more inflected language than English and agreement occurs in verb and noun phrases, number of errors in both noun- and verb-phrase could have contributed to the discrimination between the SS children with NL and with LI in this study. It may be that LI affects production of noun phrases to the same extent as verb phrases in SS children, whereas LI affects verb phrases more than noun phrases in ES children (e.g., Gavin et al, 1993; Rice, Wexler, & Cleave, 1995).

According to the results of the MLTU measure, the other spontaneous language-form analysis, the SS children with LI used less complex sentences than the SS children with NL. This result is compatible with Linares-Orama and Sanders’ (1977) report that SS children with LI constructed significantly less complex sentences than SS children with NL, even though the units of measurement and the children’s ages differed between studies. Linares-Orama and Sanders used MLU to describe the language of preschool children, whereas the current study used MLTU to describe the language of young school-age children. Thus, investigators using measures of syntactic complexity to discriminate between SS children with NL and with LI may find that different measures are most appropriate for different age groups. It may be that MLU identifies preschool SS children with LI, and MLTU identifies school-age SS children with LI.

The overall findings of the present study indicate that SS children with NL
and with LI can be identified using measures derived from only two procedures: parent interview and spontaneous language-form analysis. The findings of the parent interview measures suggest that parents appear to be a valuable source of information when discriminating SS children with NL and with LI. Parental report of the children’s language skills seems to be sensitive to the determination of whether or not the child has an LI. In addition, parents are useful in reporting risk factors for LI in SS children by providing their family history of speech, language, and academic problems.

The findings of the language-form analyses corroborate the report that a language-form deficit characterized by morphosyntactic problems is the hallmark of children with LI across languages (e.g., Dromi et al, 1993; Leonard, 1994). The SS children with LI made more morphosyntactic errors, as demonstrated by their performance on the NETU measure; and they used less complex sentences than the SS children with NL, as demonstrated by their performance on the MLTU measure. However, only an analysis of the types of grammatical errors the children made would help determine whether or not a marked grammatical morphology deficit is characteristic of SS children with LI (cf. Dromi et al., 1993; Lehecková, 1988; Leonard et al., 1992).

This study’s findings support an assumption made at the beginning of the study: children with LI demonstrate certain characteristics regardless of the language they speak, and measures of these characteristics help in the identification of SS children with LI. SS children with LI have: (a) a higher prevalence of family history of speech.
and language problems than SS children with NL, and (b) a marked language-form
deficit characterized by morphosyntactic problems. These findings demonstrate that a
broad-based approach was useful for the identification of SS children with LI, given the
contribution of the FHSLP and the PRSLP measures to the discriminant models, in
addition to the language-form measures.

The measures that did not contribute to the discriminant models deserve a
closer look, as negative findings can occur for various reasons. For instance, significant
differences between groups are a necessary but not a sufficient condition to discriminate
accurately between the groups. Despite significant group differences, the groups may
overlap to a degree that performance on the measure does not contribute to the
discrimination between groups. For example, the nonverbal measures of nonverbal
intelligence, spatial-rotation, and motor-sequential skills were selected as possible
discriminators between the SS children with NL and with LI because these nonverbal
skills have been found to differentiate ES children with LI from controls (e.g. Savich,
1984; Swisher, et al., 1994; Kamhi et al., 1988). However, these measures did not
contribute to the discriminant models in this study.

Negative findings may also be due to task effects. For example, Roseberry
and Connell (1991) demonstrated that an English bound-morpheme-learning measure
was useful in classifying 85% of SS children with NL and with LI into the appropriate
groups. However, the learning measures used in the current study did not contribute to the discrimination between SS children with NL and with LI. It may be that the learning measures in the current study did not tax the children's language system enough to produce group differences. In line with this possibility, Connell (1987) and Connell and Stone (1992) have found that children with LI perform as well as controls when required to imitate affixed words while learning a bound morpheme; when the children are not required to imitate the affixed forms significant group differences occur. In the current study, the children used imitation during the vocabulary and the bound-morpheme tasks. This imitation component might have masked the SS children’s group differences in learning.

Although the discriminant functions obtained with the current study resulted in high discriminant accuracy of the SS children with NL and with LI, it should be noted that most likely they do not apply to populations other than the one sampled. Inappropriate use of the discriminant functions can lead to misclassification of children in the same manner that the use of tests with inappropriate populations does (Anderson, in press; Ortiz, 1987; Wilkinson & Ortiz, 1986). In addition, inappropriate use of the discriminant function such as selecting only one measure to identify SS children with LI would also lead to the misclassification of SS children.

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4I attempted to use Roseberry and Connell’s (1991) paradigm; however, during pilot work the SS children with NL refused to do the task in English, and thus I adapted the learning measure to Spanish. I kept the meaning of the bound morpheme (half of an object), but presented the task in Spanish with common nouns to teach the rule and with novel nouns to test for generalization.
The use of discriminant analyses has been proven to be a useful data-based approach for selecting measures that identify ES children with LI and adults with LI (e.g., Gavin, et al., 1993; Plante & Vance, 1994; Plante & Vance, 1995; Tomblin, Freese, & Records, 1992). The current study used this statistical technique to find the measures that best identified the SS children with LI and to validate the measures with a group from which the discriminant function was not obtained. Although the results of the current study may not generalize to other populations, the research design and statistical methods used to select and validate measures to identify the SS children with LI can be applied to other populations.

The current study only focused on SS children with moderate to severe LI between the ages of 5 to 7 years; however, there are no validated measures for identifying SS children with LI who are in different age groups or have a mild LI. Thus, the measures that discriminated between the SS children with NL and with LI in the current study are candidates for adaptation and validation as identifiers of SS children with LI with characteristics different from those of the children in the current study. In addition, measures similar to those that discriminated in this study can be developed and validated to identify children with LI from other sociolinguistic backgrounds.

The continuation of data-based approaches to the identification of children with LI for whom there are no validated language measures is imperative. The social consequences for the children that are misclassified are serious (cf. Plante & Vance,
Children with LI that are not identified may drop out of school because of academic failure. Those children that remain in school would not necessarily have the academic support to succeed in school, and would not necessarily have the awareness needed to attempt to compensate for their deficits. On the other hand, a child with NL that is misidentified as LI could carry this diagnosis for life. Such a child could suffer social and psychological alienation.

**Summary and Conclusions**

The current study identified a set of measures that accurately and efficiently discriminated between a sample of school-age, SS children with moderate to severe LI and SS children with NL. Measures derived from only two types of procedures, a parent interview and language analysis, discriminated the two groups of children with an accuracy above 90%. These findings were then validated on a sample different from the one in which the discriminant functions were derived. This validation confirmed that the results of the study were stable.

The results of the current study suggest that clinicians and researchers interested in identifying SS children with LI need to continue to use standard evaluation procedures: parent interview and spontaneous language-form analysis. The results of the parent interview suggest that parental report of the child’s language skills, and of family history of speech, language, or academic problems contributes valuable information to the process of identifying SS children with LI. However, further research
is necessary to determine whether parental report contributes to the discrimination between SS children with NL and with LI when the children are not yet diagnosed as having an LI.

Two of the four measures that discriminated between the SS children with NL and with LI focused on language form. This finding corroborates that a language-form deficit characterized by morphosyntactic problems is the hallmark of children with LI (e.g., Dromi et al., 1993; Leonard, 1994). The results of the spontaneous language-form analyses suggest that SS children with LI make more morphosyntactic errors and use less complex sentences than SS children with NL.

This study was designed with the assumption that children with LI demonstrate certain characteristics that are not dependent on the language they speak, but on the nature of the disorder. Findings of language-form deficits and family history of speech and language problems indicate that SS children with LI demonstrate some of these characteristics. In addition, these findings support that the use of a broad range of measures for the identification of SS children with LI was indeed valuable for the purpose of the study and for determining target areas for future research on the identification of SS children with LI.

Plante and Vance (1994) call for data-based approaches to the selection of measures to identify children with LI. Evidence of a high level of discriminant accuracy demonstrates that a measure to identify children with LI actually serves the purpose for
which it is used (Plante & Vance, 1994). Arbitrary selection of measures to identify children with LI has serious social consequences for the children. Therefore, it is imperative that research continue to address the critical need for validated measures that identify accurately and efficiently SS children with LI.
## HOME BILINGUAL USAGE ESTIMATE

© Rudolph V. Skoczyłos 1971
7350 Dowdy St.
Gilroy, Calif. 95020

<table>
<thead>
<tr>
<th>Name of Subject</th>
<th>Age</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Telephone No.</td>
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### Score Box

<table>
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<tr>
<th>LISTENING: Total Part 1</th>
<th>Spanish</th>
<th>English</th>
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</thead>
<tbody>
<tr>
<td>Total Part 2 (Mother)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Part 2 (Father)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Part 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL LISTENING</td>
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<td></td>
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<tr>
<td>SPEAKING: Part 4</td>
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<td>TOTAL SPEAKING</td>
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<td>TOTAL Eng.</td>
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**FINAL SCORE:**
The difference between TOTAL Sp. and TOTAL Eng. ———

**JUDGMENT**

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1. Mother ♦ Father</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Father ♦ Mother</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Brothers ♦ Brothers &amp; Sisters</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reprinted with permission from the author (1995)
This sheet is not to be used in the interview. The information needed to complete this form is contained in LISTENING: Part 3, and SPEAKING: Part 4 of the ESTIMATE.

To determine the pattern of listening and speaking usage of the three generations represented in the ESTIMATE after the interview is over, refer to Parts 3 and 4 of the ESTIMATE. For each item, add the Spanish score in Part 3 to the Spanish score in Part 4 and enter the total in the Spanish column for that item on the THREE-GENERATION BILINGUAL USAGE form below. For example, if Item 1. Brothers & Sisters → Subject in Part 3 shows a Spanish score of 2 and Item 1. Subject → Brothers & Sisters in Part 4 shows a Spanish score of 1, the total Spanish for Item 1, on the THREE-GENERATION BILINGUAL USAGE form is 3. Compute the Spanish usage scores for all the items in the same way. Then, compute the English usage scores for the same items.

THREE-GENERATION BILINGUAL USAGE

(From LISTENING: Part 3, and SPEAKING: Part 4 of ESTIMATE)

<table>
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<tr>
<th>3RD GENERATION</th>
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<tbody>
<tr>
<td>Item 1. Brothers &amp; Sisters</td>
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<tr>
<td>Item 2. Cousins</td>
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<td>Item 3. Playmates</td>
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<td>Item 5. Father</td>
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<td>Item 6. Aunts</td>
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<td>Item 7. Uncles</td>
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<tr>
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<td>Item 9. Grandfathers</td>
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### LISTENING: Part 2

Mother speaks to other children

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<td>9.</td>
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<td>10.</td>
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**TOTAL Part 2 (Mother)**

### LISTENING: Part 3

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<thead>
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<tbody>
<tr>
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</table>

**TOTAL Part 3**

### SPEAKING: Part 4

Father speaks to other children

<table>
<thead>
<tr>
<th>Sp.</th>
<th>Eng.</th>
<th>Subject</th>
</tr>
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<tbody>
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</tbody>
</table>

**TOTAL Part 4**

### END OF INTERVIEW
APPENDIX B

Teacher’s Questionnaire

Cuestionario Para Maestros Sobre el Lenguaje del Niño(a) en la Casa y en la Escuela

<table>
<thead>
<tr>
<th>Nombre del Niño(a)</th>
<th>Escuela/Grado</th>
<th>Edad del Niño(a)</th>
<th>Maestro(a)</th>
</tr>
</thead>
</table>

Uso se refiere a cuánto usa o escucha el niño cada lenguaje. De información de cada lenguaje, inglés y español. Marque:

0 - Nunca usa el lenguaje indicado (Lenguaje Expresivo). Escucha el lenguaje muy poco (Lenguaje Receptivo).
1 - Usa un poco el lenguaje indicado (Lenguaje Expresivo). Lo escucha algunas veces (Lenguaje Receptivo).
2 - Usa el lenguaje indicado casi todo el tiempo (Lenguaje Expresivo). Lo escucha casi todo el tiempo (Lenguaje Receptivo).

Proficiencia (Prof) se refiere a qué bien habla o entiende el niño cada lenguaje. De información de cada uno. Marque:

0 - No puede hablar el lenguaje indicado tiene unas pocas palabras o frases, no produce oraciones (Lenguaje Expresivo). Entiende solo unas pocas palabras (Lenguaje Receptivo).
1 - Proficiencia limitada con errores gramaticales y poco vocabulario (Lenguaje Expresivo). Entiende la idea general de lo que se le dice (Lenguaje Receptivo).
2- Buena proficiencia con pocos errores gramaticales y buen vocabulario (Lenguaje Expresivo). Entiende casi todo lo que se le dice (Lenguaje Receptivo).

<table>
<thead>
<tr>
<th>Lenguaje Expresivo</th>
<th>INGLES</th>
<th>ESPAÑOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Habla con usted en la clase</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
<tr>
<td>2. Habla con los ayudantes</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
<tr>
<td>3. Habla con su mejor amigo(a)</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
<tr>
<td>4. Habla con sus compañeros</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
<tr>
<td>5. Habla fuera de la clase</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
<tr>
<td>6. Habla con sus padres</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
<tr>
<td>7. Habla con sus hermanos(as)</td>
<td>0 1 2  0 1 2</td>
<td>0 1 2  0 1 2</td>
</tr>
</tbody>
</table>
8. Habla con sus parientes
9. Habla en un programa después de la escuela o con la babysitter

Lenguaje Receptivo
1. Escucha de usted en clase
2. Escucha de los ayudantes
3. Escucha de su mejor amigo(a)
4. Escucha de sus compañeros
5. Escucha fuera de clase
6. Escucha de sus padres
7. Escucha de sus hermanos(as)
8. Escucha de sus parientes
9. Escucha en un programa después de la escuela o de la babysitter

Cree usted que el(la) niño(a) tiene problemas de lenguaje? SI/NO
Cree usted que el(la) niño(a) tiene problemas académicos o de aprendizaje? SI/NO
Cree usted que el(la) niño(a) tiene problemas sociales o de comportamiento? SI/NO
Cree usted que el(la) niño(a) tiene problemas físicos? SI/NO

Comentarios de la Maestra:
Questionnaire for Teachers About the Child's Language at Home and at School

Name of the child ___________________ School/Grade ___________________
Age of the child _______________ Teacher __________________________

Use refers to how much the child uses each language. Give information on each language, English and Spanish. Mark for Use:

0 - Never uses the indicated language (Expressive Language), hears it very little (Receptive Language)
1 - Uses the indicated language a little (Expressive Language), hears it sometimes (Receptive Language)
2 - Uses the indicated language most of the time (Expressive Language), hears it most of the time (Receptive Language)

Proficiency (Prof) refers to how well the child speaks each language. Give information on each language. Mark for Prof:

0 - Cannot speak the indicated language has a few words or phrases (Expressive Language), cannot produce sentences, only understands a few words (Receptive Language)
1 - Limited proficiency with grammatical errors, limited vocabulary (Expressive Language), understands the general idea of what is being said (Receptive Language)
2 - Good proficiency with few grammatical errors, good vocabulary (Expressive Language), understands most of what is said (Receptive Language)

<table>
<thead>
<tr>
<th>Expressive Language</th>
<th>ENGLISH</th>
<th>SPANISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Speaks with you in class</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>2. Speaks with aides</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>3. Speaks with best friend</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>4. Speaks with classmates</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>5. Speaks outside class</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>6. Speaks with parents</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>7. Speaks with brothers/sists</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>8. Speaks with other family</td>
<td>0 1 2</td>
<td>0 1 2</td>
</tr>
<tr>
<td>9. Speaks it in a program after school or at the babysitter</td>
<td>0 1 2</td>
<td>0 1 2</td>
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</table>

Receptive Language
<table>
<thead>
<tr>
<th>1. Listens to you in class</th>
<th>012 012</th>
<th>012 012</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Listens to aides</td>
<td>012 012</td>
<td>012 012</td>
</tr>
<tr>
<td>3. Listens to best friend</td>
<td>012 012</td>
<td>012 012</td>
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<tr>
<td>4. Listens to classmates</td>
<td>012 012</td>
<td>012 012</td>
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<tr>
<td>5. Listens outside class</td>
<td>012 012</td>
<td>012 012</td>
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<tr>
<td>6. Listens to parents</td>
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<tr>
<td>7. Listens to brothers/sists</td>
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</tr>
<tr>
<td>8. Listens to other family</td>
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<td>012 012</td>
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<tr>
<td>9. Listens to in a program after school or at the babysitter</td>
<td>012 012</td>
<td>012 012</td>
</tr>
</tbody>
</table>

Do you think the child has language problems? YES/NO
Do you think the child has academic or learning problems? YES/NO
Do you think the child has behavioral or social problems? YES/NO
Do you think the child has physical problems? YES/NO

Teacher's Comments
APPENDIX C

Sample of Morphosyntactic Errors in a Language Sample

*ANA: sí, está buscando la rana.
*ANA: <mhmm>.
*ANA: era un venado, verdad?
*JON: y lo tiró al agua. [+ TU]
*ANA: sí.
*JON: lo tiró otra vez. [+ TU]
*ANA: <mhmm>.
*JON: <el> el Paco se va a ti [= tirar] así [* 3] el agua. [+ TU]
*JON: todavía allá.
*ANA: <mhmm>.
*JON: hace ra ru ar ru. [+ TU]
*ANA: y qué más?
*JON: allí tá [= está] allá atrás. [+ TU]
*JON: allá [* 4] la rana. [+ TU]
*ANA: <mhmm>.
*ANA: a ver.
*ANA: qué están haciendo aquí?
*JON: está XXX.
*JON: shhh.
*ANA: <mhmm>.
*JON: y allí etá [= está]. [+ TU]
*ANA: okay.
*JON: allí tán [= están] ya. [+ TU]
*JON: y que [* 5] están allá alcando [= arrancando]. [+ TU].
*ANA: <mhmm>.
*JON: le [* 6] allí etá [= está]. [+ TU]
*JON: y aquí tán [= están] ya. [+ TU]
*ANA: <mhmm>.
*JON: allí <ta llev um> [/] tá [= está] llevando. [+ TU]
*ANA: <mhmm>.
*ANA: a quién se llevó?
*JON: el rana.

**Errors**

1. article gender agreement
2. preposition omission
3. preposition omission
4. verb omission
5. conjunction addition
6. pronoun addition/subs.

---

**Examples**

*JON: child with LI, ANA = research assistant, [* #] = morphosyntactic error in a T-unit [+ TU] = terminable unit, XXX = unintelligible, [/] or [/] retrace.
APPENDIX D
Stimuli for the Learning Measures

Novel Vocabulary

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<td>pefono</td>
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<tr>
<td>tijo</td>
<td>tijono</td>
</tr>
<tr>
<td>godo</td>
<td>godono</td>
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</tbody>
</table>

Vocabulary for training the novel bound morpheme

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APPENDIX E

Parent Interview

Cuestionario para la familia  Fecha: _/_/   Code:   Fecha de nacimiento del niño(a): _/_/   Edad del niño(a):_
Nombre del niño(a):   Nombre del informante:   Relación con el niño(a):   
Opinión de la familia el niño(a) tiene problemas del habla o del lenguaje

1. En comparación con otros niños de la misma edad piensa usted que su niño(a) tiene problemas expresándose o haciéndose entender (entendido)?   sí no
2. En comparación con otros niños de la misma edad piensa usted que su niño(a) tiene problemas del habla?   sí no
3. Piensan su familia o amigos que su niño(a) está atrasado/a en su lenguaje?   sí no
4. Para su edad o en comparación con otros niños, tiene su niño(a) problemas diciendo frases correctas?   sí no
5. Piensan su familia o amigos que su niño(a) es difícil de entender?   sí no
6. Para su edad, dice su niño(a) frases muy cortas?   sí no
7. Piensa usted que su niño(a) tiene problemas con la gramática? (errores en sus frases)   sí no
8. Cuando su niño(a) habla de la misma persona tiene dificultad usando el pronombre correcto como él, ella, ellos?   sí no
9. Cuando su niño(a) habla de algo que ha pasado, tiene su niño(a) problemas explicando cuándo las cosas ocurrieron, o usa palabras en distintos tiempos? Por ejemplo, hablando de ayer usa "habla" en vez de "habló"   sí no
10. Dice su niño frases correctas casi todo el tiempo?   sí no
11. Cuando su niño(a) habla, tiene problemas diferenciando si está hablando de un hombre o una mujer?   sí no
12. En comparación con otros niños de su misma edad, usa su niño(a) muchas palabras muy generales poco descriptivas como esa cosa, esta cosa?   sí no
13. Tiene su niño(a) problemas encontrando las palabras exactas para expresarse?   sí no
14. Tiene su niño(a) problemas explicando o describiendo cosas?   sí no
15. Es difícil para su niño decirle que ha hecho durante el día?   sí no
16. Se siente su niño frustrado porque no puede hablar bien?   sí no
17. Tienen ustedes o los hermanos del niño(a) que repetirle lo que le dicen con más frecuencia que a otros niños?   sí no
18. Tiene usted que repetirle a su niño(a) instrucciones o preguntas más que a otros niños?   sí no
19. Entiende su niño casi todo lo que la gente le dice?   sí no
20. Piensa que su niño(a) tiene problemas aprendiendo palabras nuevas?   sí no
21. En comparación con otros niños de su misma edad, es difícil para su niño(a) aprender ideas (conceptos) nuevas(os)?   sí no
22. En comparación con otros niños de su misma edad, tiene su niño un vocabulario muy bajito o limitado?   sí no
23. Piensa usted que su niño(a) tiene un problema de aprendizaje?   sí no
24. Tiene su niño(a) dislexia? (dificultad con la lectura y escritura)   sí no
25. Para su edad, tiene su niño(a) problemas poniendo atención por mucho tiempo?  
26. Es su niño(a) hiperactivo/a?  
27. Le da trabajo a su niño(a) atender a una actividad o juego?  
28. Para su edad, tiene su niño(a) problemas pronunciando palabras?  
29. Es la pronunciación de su niño fácil de entender?

### Historia de problemas del habla y lenguaje en la familia

<table>
<thead>
<tr>
<th>Ha tenido o tuvo <strong>alguno de los hermanos(as)</strong> del niño(a),</th>
<th>Hermanos</th>
<th>Papá</th>
<th>Mamá</th>
<th>Par/pad</th>
<th>Par/mad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alguien en su familia ha tenido o tiene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. desarrollo de lenguaje normal</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>31. problemas de atención o hiperactividad</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>32. dificultad en la escuela o problemas de aprendizaje</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>33. dislexia o problemas aprendiendo a leer</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>34. problemas del habla o de pronunciación</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>35. problemas de lenguaje en sus frases, palabra (+5)</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>36. clases de educación especial</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>37. terapia del habla o lenguaje</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>38. un programa para niños con problemas de aprendizaje, del habla o lenguaje</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>39. después de los 3 años de edad,... problemas omitiendo palabras o partes de palabras en sus frases</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>40. problemas diciendo frases correctas</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>41. problemas haciéndose entender</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>42. problemas expresando ideas con palabras</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>43. problemas siguiendo instrucciones</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>44. problemas entendiendo preguntas</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>45. problemas entendiendo lo que se le dice</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>46. problemas produciendo ciertos sonidos</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>47. problemas leyendo o aprendiendo a leer</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>48. tartamudea (después de los 4 años de edad)</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>49. problemas aprendiendo inglés</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
<tr>
<td>50. repitió uno o más años en la escuela</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
<td>sí no</td>
</tr>
</tbody>
</table>

**Comments:**
Questionnaire for the family  

Today's date: ___   Code: ___   Date of Birth ___/___/___   Age of the child: ___

Child's name: ___  Name of the informant: ___  Your relation to the child: ___

Family's opinion if the child has speech or language problems

1. In comparison with other children of the same age, do you think that your child has problems expressing himself/herself or being understood?      yes no
2. In comparison with children of the same age, do you think that your child has speech problems?      yes no
3. Do you family or friends think that your child is delayed in language?      yes no
4. For his age or in comparison with other children, does your child have difficulty producing correct phrases?      yes no
5. Do your family or friends think that your child is difficult to understand?      yes no
6. For his age, does your child produce very short phrases?      yes no
7. Do you think that your child has problems with his/her grammar?      yes no
8. When your child talks about the same person, does he/she have difficulty using the correct pronoun like he, she, they all the time in his/her conversation?      yes no
9. When your child talks about something that happened, does he/she have difficulty explaining when this happened or uses words in different times? For example, talking about yesterday the child say "falls" instead of "fell"      yes no
10. Does you child use correct phrases almost all the time?      yes no
11. When your child talks, does he/she have difficulty differentiating whether he/she is talking about a man or a woman?      yes no
12. In comparison with other children of the same age, does your child use many words that are too general and not descriptive such as this, that, thing?      yes no
13. Does your child have difficulty finding the exact words to express him/herself?      yes no
14. Does your child have difficulty explaining or describing things?      yes no
15. Is it difficult for your child to tell you what he/she did during the day?      yes no
16. Is your child frustrated because he/she can not talk well?      yes no
17. Do you or your child's siblings have to repeat what you say to him or her with more frequency than to other children?      yes no
18. Do you have to repeat questions or directions to your child more than to other children?      yes no
19. Does your child understand most of what he/she is told?      yes no
20. Do you think that your child has difficulty learning new words?      yes no
21. In comparison with children of the same age, is it difficult for your child to learn new ideas?      yes no
22. In comparison with children of the same age, does your child have a very low or limited vocabulary?      yes no
23. Do you think that your child has a learning problem?      yes no
24. Does your child have dyslexia?      yes no
25. For his age, does your child have difficulty paying attention for a long period?      yes no
26. Is your child hyperactive?      yes no
27. Does your child have difficulty attending to an activity or game?      yes no
28. For his age, does your child have difficulty pronouncing words?
   yes no

29. Is your child's pronunciation easy to understand?
   yes no

History of speech and language problems in the family

Has or had any of the child's brothers or sisters any of the following problems?

<table>
<thead>
<tr>
<th>Problem</th>
<th>bro/sist</th>
<th>father</th>
<th>mother</th>
<th>par/fath</th>
<th>par/moth</th>
</tr>
</thead>
<tbody>
<tr>
<td>30. Normal language development</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>31. Problems of attention or hyperactivity</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>32. Difficulties in school or learning</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>33. Dyslexia or a problem learning to read</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>34. Speech or pronunciation problems</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>35. Language problems, like in phrases, words, and grammar</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>36. Special education classes</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>37. Speech and language therapy</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>38. Program for children with speech, language or learning problems</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>39. Omit words or parts of words in his/her phrases after age 3</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>40. Problems producing correct sentences</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>41. Problems making his/herself understood</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>42. Problems expressing ideas with words</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>43. Problems following directions</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>44. Problems understanding questions</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>45. Problems understanding what he/she is told</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>46. Problems producing certain sounds</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>47. Problems reading or learning to read</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>48. Stuttering after 4 years of age</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>49. Difficulty learning English</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
<tr>
<td>50. Repeated one or more grades</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
</tr>
</tbody>
</table>

Comments:
APPENDIX F

Use of the Discriminant Functions

<table>
<thead>
<tr>
<th>Measure</th>
<th>scores of child with NL</th>
<th>scores of child with LI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRSLP</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>NETU</td>
<td>0.137</td>
<td>0.477</td>
</tr>
<tr>
<td>MLTU</td>
<td>5.72</td>
<td>3.99</td>
</tr>
<tr>
<td>FHSLP</td>
<td>2</td>
<td>15</td>
</tr>
</tbody>
</table>

Procedure

Enter the children’s raw scores for each measure into either the two-measure or four-measure discriminant function.

Multiply each measure’s score with its weight score of the discriminant function.

Add all scores following the discriminant function formula.

If the score is < 0, performance is consistent with that of a SS child with NL.

If the score is > 0, performance is consistent with that of a SS child with LI.

Discriminant Functions

Four-measure model

\[ = -0.2084969 + PRSLP(0.1019379) + NETU(4.0810516) + MLTU(-0.5324122) + FHSLP(0.0429730) \]

\[ = -0.2084969 + 7(0.1019379) + 0.137(4.0810516) + 5.72(-0.5324122) + 2(0.0429730) \]

\[ = -0.2084969 + 0.835653 + 0.559104 - 3.0613701 + 0.085946 \]

\[ = -1.789164 < 0 = \text{child with NL}. \]

Two-measure model

\[ = -2.6891560 + PRSLP(0.1447095) + NETU(4.3891402) \]

\[ = -2.6891560 + 18(0.1447095) + 0.477(4.3891402) \]

\[ = -2.6891560 + 2.604771 + 2.0936198 \]

\[ = 2.0092338 > 0 = \text{child with LI}. \]

Note. NL = normal language, LI = language impairment, PRSLP = parent report of speech and language problems, NETU = number of errors per T-unit, mean length of T-unit, FHSLP = family history of speech and language problems.
REFERENCES


Evard, B.L. & Sabers, D.L. (1979). Speech and language testing with distinct


