Specific Language Impairment: Evaluation and detection of differential psycholinguistic markers in phonology and morphosyntax in Spanish-speaking children.

Juan J. Buiza*, José A. Adrián*, María José Rodríguez-Parra**, Mercedes González-Sánchez*

*Department of Personality, Psychological Evaluation and Treatment, University of Malaga, Malaga, Spain

**Department of Personality, Psychological Evaluation and Treatment, University of Granada, Granada, Spain

Abstract

Background: The diagnosis of Specific Language Impairment (SLI) is very complex, given the great variety of clinical pictures described in this language disorder. Knowledge about the linguistic markers of SLI can facilitate its differentiation from the normal profile of language development and these markers can also be used as tools and in tasks that may improve diagnostic accuracy.

Aims: To determine which psycholinguistic markers best discriminate Spanish-speaking children with SLI from children with typical language development.

Method and Procedure: The performance of 31 Spanish-speaking children with SLI was analysed using a battery of 13 psycholinguistic tasks organized into two areas: phonology and morphosyntax. The performance of the SLI group was compared to that of two subgroups of controls: aged-matched (CA) and linguistically matched (CL).

Outcomes and Results: The data show that the SLI group performed worse than the CA subgroup on all 13 verbal tasks. However, the performance of the SLI group did not

significantly differ from that of the CL subgroup on most (11/13) of the tasks. Stepwise discriminant analysis established the canonical function of three tasks (diadochokinesis, sentence understanding, and morphologic integration) which significantly discriminated SLI from CA.

Conclusions and Implications: These results contribute to determining the psycholinguistic and clinical characteristics of SLI in Spanish-speaking children and provide some methods for screening assessment.

Keywords: Specific Language Impairment, language delay, language assessment, Spanish

1. Introduction

In recent decades, numerous studies have sought to determine the main linguistic markers of Specific Language Impairment (SLI). The diagnosis of this difficulty in the acquisition and development of language — which is without a specific neurological, sensory or physical origin — is very complex, given the great variety of clinical pictures described in this language disorder. From an epistemological point of view, the linguistic markers of SLI facilitate its differentiation from the normal profile of language development and identify risk factors. These markers can also be used as tools and in tasks that may improve diagnostic accuracy in clinical, educational, and speech-language pathology contexts.

Many diagnostic tasks have been proposed based on markers identified at various levels of linguistic analysis. Leonard has emphasized that the assessment and treatment of SLI requires knowledge of its specific markers or features. Moreover, he suggests that the study of clinical markers in children with SLI should be a multi-lingual effort: "…The greater the number of languages studied, therefore, the greater the number of children who can be served in an informed manner" (Leonard, 1998, p. 89). With this in mind, different studies

have shown numerous linguistic markers of SLI in different languages (e.g., Chinese Cantonese, English, Finnish, French, German, Greek, Hebrew, Italian, Spanish, and Swedish). Generally, it is clear that SLI markers are numerous, occur in many different languages, and span all areas of analysis of language (phonology, morphosyntax, semantics, and pragmatics). Moreover, the profiles of children with SLI can differ according to the language they speak. In this article we only focus on the features present in Spanish-speakers with SLI and significant markers in two linguistic areas: phonology and morphosyntax.

Spanish is one of the most commonly spoken languages in the world. Approximately 500 million people speak the language and it is the primary language spoken at home by over 35.5 million people aged 5 years or older, or approximately 12.4% of the population of the United States. Thus, an early, accurate, and reliable means of identifying the SLI profile among Spanish speakers would be of great use to clinicians working in the diagnosis and intervention of this disorder. Although studies to identify markers in Spanish-speaking children with SLI are becoming more numerous, these are still exceeded by studies on children whose native language is English.

Research on the characteristics of Spanish-speaking children with SLI disorders has indicated that in the area of phonology there are delays in segmental element acquisition (Serra, 2002), syllabic omissions in spontaneous speech (Aguilar, 2002; Serra, 2002), nonword repetition deficits (Aguado, Cuetos, Domenzain, & Pascual, 2006; Ebert, Kalanek, Cordero, & Kohnert, 2008; Martínez, Herrera, Valle, & Vázquez, 200), greater difficulty in word repetition and nonword repetition when these elements are located at the beginning of a sentence (Martinez, Bruna, Guzman, Herrera, Valley, & Vazquez, 2001, 2002), deficits in phonological awareness (de Barbieri & Coloma, 2004), and problems retrieving

phonological forms (Gallego, Revilla, & Schüller, 2000). In addition, syllabic omissions have been demonstrated in Spanish–Catalan bilingual children with SLI (Aguilar-Mediavilla, Sanz-Torrent, & Serra-Raventos, 2007), and nonword repetition deficits in Spanish–English bilingual children with SLI (Girbau & Schwartz, 2007, 2008).

Regarding morphosyntax, several studies have revealed significant limitations in adjective-agreement inflections (e.g., Bedore & Leonard, 2001), problems with the use of articles or clitic pronouns (Anderson, 2001; Anderson & Lockowitz, 2009; Anderson & Souto, 2005; Bedore & Leonard, 2005; Bosch & Serra, 1997; de la Mora Gutierrez, 2004; Restrepo & Gutierrez-Clellen, 2004; Serra, 2002), difficulties with verbal inflections (Bedore & Leonard, 2001; Grinstead, Baron, Vega-Mendoza, de la Mora, Cantú-Sánchez, & Flores, 2012; Serra, Aguilar & Sanz, 2002), a high number of errors in clausal utterances (Restrepo, 1998), and the production of incomprehensible and confusing messages (Sanz, 2002; Serra, 2002). Furthermore, problems have also been demonstrated in Spanish–Catalan bilingual children with SLI in the use of articles or clitic pronouns (Sanz-Torrent, Serrat, Andreu, & Serra, 2008), function word omission (Aguilar-Mediavilla, Sanz-Torrent, & Serra-Raventos, 2007) and syntactic errors in sentence production (Andreu, Sanz-Torrent, Guardia-Olmos, & MacWhinney, 2011). Difficulties have also been found in Spanish–English bilingual children with SLI with verbal inflections (Simon-Cereijido, 2009) and deficits in the use of articles or clitic pronouns (Simon-Cereijido & Gutierrez-Clellen, 2007).

Researchers from the University of Antioquia in Colombia (Hincapie-Henao et al., 2008) compared the profiles of linguistic markers in a group of Spanish-speaking children with SLI and age-matched controls from Medellín City. The children with SLI experienced difficulty in all the linguistic dimensions assessed (phonological, morphosyntactic, and

semantic). The most notable differences between the SLI and control groups were in nonword repetition, phrase repetition, comprehension in complex morphosyntactic structures and elaborated sentences, and verbal expression, especially in formulated sentences.

Therefore, studies on Spanish-speaking children with SLI show that they have difficulties in their language development; however, the results usually show that a large number of factors are involved and that there is variability in phonology and morphosyntax. In fact, Leonard concluded that "...there is significant heterogeneity among children with SLI" and that "...there are striking differences between languages in children with SLI" (Leonard, 2009, p.169). These issues should be addressed in further studies to better describe the clinical evaluation of Spanish-speaking children with SLI and the clinical profile of SLI.

International diagnostic systems show a lack of consensus on the clinical evaluation of disorders related to neurocognitive and language development. In Spain, many of the deficits that are included in this group (such as SLI) are labeled by clinicians in different ways, depending on the institution or professional group (medical, psychological, or educational) conducting the assessment (see Tannock, 2013 for an updated discussion about this problem in different countries and contexts).

On the one hand, from a clinical perspective (psychiatric and psychological), the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1994) includes *Communication disorders* (expressive language, receptive-expressive, phonological, and stuttering) and *Learning disorders* (reading, writing, and mathematics) under the general heading of *Disorders in infancy, childhood, or adolescence*. The DSM-V recently included *Social communication* or *pragmatic disorder* within *Communication disorders*, and

maintained the same terminology as the DSM-IV to denominate the aforementioned disorders.

On the other hand, in educational settings, counselors or education specialists prefer to group these problems under the term *Learning disabilities* (LD) or more specifically *Specific learning disabilities* (SLD). The aim is to help students with these problems to compensate for their deficits with aim of continuing their normal educational development. The Individuals with Disabilities Education Act (IDEA, 2004) was a federal law enacted in the United States that attempted to clarify and regulate the different criteria. The IDEA limited SLD to only include problems that have language difficulties as their primary basis, and thus children with speech and language communication disorders, such as SLI, were included within the SLD group. The 2013 Organic Law for the Improvement of Educational Quality (LOMCE, in Spanish) reflects the current concerns of Spanish political and educational authorities regarding SLD. The creation of a system for the early detection of SLI and its intervention is obviously desirable, as this would help to improve language skills, reading skills, and other basic disciplines and mitigate potential problems in the personal and psycho-educational development of SLI students.

The purpose of this study was: 1) To test a group of Spanish-speaking children with SLI versus a control group matched by chronological age and a control group matched by linguistic age to establish differential psycholinguistic markers in phonology and morphosyntax; and 2) To propose a short reliable battery of tasks for SLI clinical screening and assessment in Spanish. The final aim was to refine the system used within educational settings to diagnose language disabilities (LD) in the Spanish language in order to improve school success.

2. Material and methods

2.1 Participants

Ninety-three children participated: 31 children with SLI (24 boys and 7 girls) and 62 children with typical language development (control group). The control group was divided into two subgroups: 31 children matched by chronological age (CA) (17 boys and 14 girls); and 31 children matched by linguistic age (CL) (22 boys and 9 girls).

2.1.1 SLI group

The children with SLI were recruited from 20 schools and three private clinics from various municipalities of the Autonomous Community of Andalusia (Spain). In general, all the participants were considered to have SLD. Inclusion was based on two criteria: a previous diagnosis of SLI by a school guidance counsellor or speech-language pathologist; and current enrolment in public and private classrooms and/or speech and language therapy centres. The literature has shown that these clinical conditions have good interrater and intrarater reliability (McGregor, Newman, Reilly, & Capone, 2002; Records & Tomblin, 1994). This aspect has also been supported by some Spanish studies. For example, Aguado et al. (2006) conducted a two-year longitudinal study that showed good convergence between language tests and the clinical judgements made by speech-language pathologists, and also confirmed that the diagnosis remained unchanged regardless of the method used. All the children in the SLI group were tested to confirm the diagnosis according to Leonard's (1998) criteria: (a) Linguistic age: The Auditory reception, Auditory association, Verbal expression, Grammatical and Auditory memory subtests was administered to establish the mean linguistic age (Illinois Test of Psycholinguistic Abilities, ITPA; Kirk, McCarthy, & Kirk, 1986). All the children with SLI scored more than 1.25 SD below the mean for their age using normalised standard scores for each age group; (b) Nonverbal IQ:

The TONI2 intelligence test (Brown, Sherbenou, & Johnsen, 1995) was administered to establish the nonverbal IQ. All the participants scored above 85; and (c) Hearing, otitis, oral structure, and oral motor functions data: All Spanish children, especially those of school age, are examined by the pediatric services of the Spanish National Health Service at least three times a year. The examination includes the detection of abnormalities and the assessment of sensory and neurological development. Parents were administered a short questionnaire on which they could indicate whether the pediatric service had detected any hearing impairment and, if so, what degree of impairment. The teachers were aware of the form and could add data if they wished to do so. The report of the speech-language pathologists, parents, and teachers confirmed no auditory losses above 20 dB. In borderline cases, a Maico MA50 audiometer was used to perform an audiometry screening test to confirm hearing acuity according to the above-mentioned criterion. In addition, tonal audiometry was performed with the same instrument according to the guidelines of the American National Standards Institute. Any participant who had hearing loss above 20 dB using pure tones in the range 500-4000 Hz was excluded from the study. It was also confirmed that none of the participants had experienced a recent otitis episode and all were free of anomalies in orofacial mobility and morphology.

Table 1 shows the demographic characteristics of the SLI group, as well as the results of clinical diagnosis and psychometric data.

Table 1. Demographic data for SLI, CA and CL participants: sample size, chronologic age, ITPA mean linguistic age and TONI2 mean nonverbal IQ.

Variable	SLI (n=31)			CA (n=31)			CL (n=31)		
	M	SD	Range	M	SD	Range	M	SD	Range
Age (yrs.;mon.)	8;2	1;3	7;7 – 8;6	8;2	1;2	7;8 – 8;7	5;9	0;10	5;6 – 6:3
ITPA (a) linguistic age score (yrs.;mon.)	5;6	1;2	5;3 – 6;0	8;1	1;3	7;6 – 8;8	5;7	0;10	5;5 – 6;2
TONI2 (b) IQ score	113.6	11.6	109.3-117.8	117.1	8.6	113.9-120.2	113.2	7.7	110.4-116.1

Note. SLI: Specific language impairment group; CA: Control age sub-group; CL: Control language sub-group

(a) Illinois Test of Psycholinguistic Abilities (ITPA; Kirk, McCarthy & Kirk, 1986). (b) Test of Nonverbal Intelligence-3 (TONI2; Brown, Sherbenou & Johnsen, 1995)

Table 2. Socio-economic and cultural level for SLI, CA and CL participants.

Level	SLI (n=31)	CA (n=31)	CL (n=31)
Low	0 (0%)	0 (0%)	0 (0%)
Low-medium	14 (45.16%)	7 (22.58%)	15 (48.38%)
Medium	12 (38.71%)	20 (64.5%)	13 (41.93%)
Medium-high	2 (6.45%)	2 (6.45%)	2 (6.45%)
High	3 (9.67%)	2 (6.45%)	1 (3.22%)

Similarly, the school guidance counsellors or the speech-language pathologists used the clinical guidelines of the DSM-IV to classify the selected children as exhibiting Expressive Language Disorder or Receptive-Expressive Language Disorder. All the participants were classified as exhibiting Mixed Receptive-Expressive Language Disorder with limitations in comprehension and verbal expression. Leonard´s criteria were strictly applied to avoid the

inclusion of children with neurological, motor, and mental disorders, or children with Pervasive Developmental Disorder (PDD).

The socio-economic and cultural level of each child was also assessed by using the parent's profession and place of residence as indicators. Place of residence was evaluated according to the perceived quality (personal perception) of the home, neighbourhood, and zone. Twenty-six participants (83.87%) were classified into the low-medium or medium levels, and the 5 remaining children (16.13%) were classified into the medium-high or high levels (Table 2).

2.1.2 Control participants matched by chronological age (CA)

The children in this control subgroup were recruited from the same geographic and social context as the SLI group. For each child with SLI in the sample, an age-matched child in the same school and classroom was chosen by the children's teacher. The teacher was instructed to choose a student who was "representative of students in the course," i.e., a child with average academic results, average communicative and behavioural abilities, and typical language development. Teams of school guidance counsellors have developed a protocol for use in Spanish schools to follow the students' psychoeducational development. This protocol was applied and if the student achieved average scores on the abovementioned aspects, but without obtaining extremely negative or positive scores, the student was considered to represent a given school year and age group. Once selected, the student was then evaluated using the ITPA and TONI2 tests. We determined that the control participants should score -1.25 SD above the mean for their age on the test ITPA, and above 85 for their nonverbal IQ. The students whose scores did not fit within these range were excluded and replaced by other students who fulfilled this criterion. The CA and SLI matched pairs had a maximum age difference of 4 months. The same tests that

were used to diagnose SLI were used to determine linguistic age and nonverbal intellectual capacity (Table 1). In the CA subgroup, 27 children (87.1%) came from medium to low-medium socioeconomic backgrounds, and four children (12.9%) came from high to medium-high backgrounds (Table 2).

2.1.3 Control participants matched by linguistic age (CL)

This subgroup consisted of younger children with typical development. They were selected from the same population as the SLI group and matched by linguistic age. Once again, we determined that the control participants should score above -1.25 SD the mean for their age on the test ITPA, and above 85 for their nonverbal IQ. The students whose scores did not fit within these range were replaced by other students who fulfilled this criterion. The CL and SLI matched pairs had a maximum age difference of 4 months as determined by the ITPA test; the TONI2 was used to evaluate nonverbal intelligence (Table 1). The socioeconomic and cultural levels of the participants were also assessed. Twenty-eight (90.32%) came from medium to low-medium socioeconomic backgrounds and three (9.68%) from high to medium-high backgrounds (Table 2).

Analyses showed that the SLI and CA groups were homogenous in terms of age [$t(60) = .11$, $p = .911$], nonverbal IQ, $t(60) = 1.36$, $p = .180$, and socio-economic and cultural level (Mann-Whitney $U = 399$, $p = .206$). The SLI and CL groups were also homogenous regarding linguistic age, $t(60) = .32$, $p = .615$, nonverbal IQ, $t(52.32) = -.14$, $p = .888$, and socio-economic and cultural level ($U = 458$, $p = .729$).

2.2 Materials

Thirteen linguistic markers were selected as dependent variables. These markers were measured using an assessment battery of psycholinguistic tasks designed for this purpose. This nonpsychometric battery assesses oral language reception and production skills. It is

applied to each individual and consists of 13 tasks that accurately indicate psycholinguistic skills: eight phonological skills tasks and five morphology and syntax skills tasks. These tasks are described in the following section; additional information is presented in the Appendix.

2.2.1 Phonological tasks (PH)

2.2.1.1 Syllable pair discrimination (SPD) task

This task assesses phonetic discrimination skills and is based on the "Nonword minimal pair discrimination" and "Word minimal pair discrimination" tests from the EPLA Battery (Valle & Cuetos, 1995) taken from the PALPA Test and adapted into Spanish (Kay, Lesser, & Coltheart, 1992). The child has to say whether the two syllables pronounced by the examiner are identical or different. Twenty-eight pairs of monosyllables are presented: 14 words (e.g., *la-la*) and 14 nonwords (e.g., *dus-dus*). Fourteen pairs are identical (e.g., *fe-fe*) , whereas the other 14 differ in the initial phoneme (e.g., *tas-pas*) and the final phoneme (e.g., *mal-mar*), or by the transposition of phonemes (e.g., *sol-los*).

2.2.1.2 Phonemic awareness (PHA) task

This is the first of three phonological awareness tasks included in the battery. It assesses the ability to segment the initial sound of a word and identify whether it is the same in a pair of words. This task was adapted from a task designed by Augusto, Adrián, Alegría, & Martínez de Antoñana (2002) for assessing metalinguistic skills. The examiner vocally administers 24 pairs of words, one pair at a time. Eight pairs have an identical initial phoneme (e.g., *p-era* and *p-ipa*); eight pairs have a very different initial phoneme (e.g., *p-ato* and *r-ana*); and eight pairs have a different initial phoneme, but which is very similar regarding its articulation or voicing (e.g., *d-edo* and *p-elo*).

2.2.1.3 Syllabic awareness (SA) task

This task complements the previous one. It assesses the ability to recognise whether the initial syllable of a pair of words is the same or not. The syllables differ in structure: consonant-vowel (C-V); vowel-consonant (V-C); consonant-vowel-consonant (C-V-C); and consonant-consonant-vowel (C-C-V). This task was also adapted from Augusto et al. (2002).

The examiner vocally presents 24 pairs of words, one pair at a time. Six pairs have an identical initial syllable (e.g., *va-so* and *va-sa*); six pairs differ and have phonetically very different initial syllables (e.g., *re-loj* and *ban-dera*); six pairs differ and have phonetically similar initial syllables (e.g., *ga-fas* and *ca-ja*); and six pairs differ but have very similar syllables (e.g., *ma-no* and *mar-tillo*).

2.2.1.4 Rhyme (R) task

This task forms part of a set of tasks for assessing phonological awareness. This task is also adapted from Augusto et al. (2002). It assesses the ability to distinguish whether a pair of words have the same consonance rhyme or not. Twenty-four pairs of words are vocally administered, one pair at a time. The participant indicates whether the two words rhyme or not. Eight of the pairs rhyme (e.g. *pi-ña* and *ni-ña*); eight pairs do not rhyme due to having phonetically very different endings (e.g. *so-bre* and *ha-cha*); and eight pairs do not rhyme, but have similar endings that only differ by only one phoneme (e.g. *ar-dilla* and *a-nillo*).

2.2.1.5 Lexical decision (LD) task

This task assesses auditory phonetic recognition and lexical decision skills. The participant has to identify whether a sequence of sounds is a word or not, independently of whether they know its meaning. This task is based on the "Auditory lexical decision:

imageability and frequency" test from the EPLA Battery (Valle & Cuetos, 1995). Ten nonwords (e.g., *latando)* and 20 words (e.g., *agua)* are vocally presented at random, one at a time. The 20 real words were taken from the Diccionario Español de Frecuencias del Lenguaje Infantil (Frequency Dictionary of Spanish Child Language, Martínez & García, 2004) based on the following criteria: high imageability and high frequency (e.g., *mano*; five words); low imageability and high frequency (e.g., *joven*; five words); low imageability and low frequency (e.g., *conseguir*; five words); and high imageability and low frequency (e.g., *brota*; five words).

2.2.1.6 Phonemic integration (PHI) task

This task investigates the processes involved in the development of a sequence of sounds, based on modifying an initial sequence. The participant has to change the sounds that are indicated within a specific monosyllable and say the resulting monosyllable. This task was adapted from the Oral Language Test (Nieto-Herrera, 1984). The examiner vocally administers 15 monosyllables and asks the participant to change specific phonemes in each case: vowel by vowel (e.g., *col*...change *o*a*....cal*); consonant by consonant (e.g., *pez*...change *e*a....paz*); and vowel by vowel and consonant by consonant (e.g., *ten*...change *e*o* and *n*s....tos*).

2.2.1.7 Diadochokinesis (DI) task

This task assesses the final execution of articulatory praxis and is based on the sequential repetition of two or three vocally presented syllables. The participant has to perform at least three repetitions, for five seconds. This task was based on one developed by Korkman & Häkkinen-Rihu (1994), which formed part of a neuropsychological assessment battery used in an experimental study in children with SLI. Twenty sequences were presented which varied in the number of syllables and in syllabic structure: five sequences of two C-V

syllables with the same manner of articulation and a different articulation point (e.g., *ta-ka*); five sequences of three C-V syllables with a different manner of articulation and the same articulation point (e.g., *bu-mu*); five sequences of two V-C syllables (e.g., *om-of*); and five sequences of two C-C-V syllables (e.g., *kru-fru*).

2.2.1.8 Nonword repetition (NWR) task

This task assesses the ability to articulate a nonword spoken by the examiner. It is based on the "Nonword repetition" and "Repetition: imageability and frequency" tasks from the EPLA Battery (Valle & Cuetos, 1995). In total, 22 items were presented: four items of three phonemes; six items of four phonemes; six items of five phonemes; and six items of six phonemes. Their combination resulted in nonwords of 1-3 syllables. These combinations of syllables varied in complexity, ranging from simple ones (containing only singleton consonants, e.g., *jata, lenego*), to others containing consonant clusters (e.g. *pratar, costru*).

2.2.2 Morphosyntactic tasks (MS)

2.2.2.1 Simple figures identification (SFI) task

This task assesses syntactic comprehension. Based on a series of visual stimuli (varying in shape, size, and colour), the participant has to identify the figure the examiner has verbally indicated, using a syntactic construction of varying complexity. The task is based on the well-known test designed by di Renzi and Vignolo (1962) and on the children's version developed by di Simoni (1978). It is presented on-screen as a series of slides. The participant touches the figure or figures indicated on the screen. There are 39 items of increasing difficulty, e.g., *toca un cuadrado*; *antes de tocar el círculo rojo pequeño, toca el cuadrado verde grande*).

2.2.2.2 Sentence understanding (SU) task

This task also investigates syntactic comprehension. A sentence is vocally administered at the same time that representative drawings are presented. The participant has to indicate the drawing that corresponds to the sentence. This is a new test inspired by the Grammatical Structure Comprehension Test (Mendoza, Carballo, Muñoz, & Fresneda, 2005).

The slides contain four drawings: the target drawing and three semantic or syntactic distractors. Syntactic complexity varies according to the type of grammatical sentence. There are six simple sentences in the active voice (e.g., *aquí hay dos círculos*); two simple sentences in the passive voice (e.g., *la niña es asustada por el niño*); one coordinated sentence (e.g., *el hombre camina y lleva una escalera*); and eight complex sentences: two causal (e.g., *el niño está contento porque tiene una pelota*), one temporal (e.g., *el sol sale cuando es de día*), one final (e.g., *la niña compra una entrada para ir al circo*), two comparative (e.g. *esta granja tiene más patos que cerdos*), and two relative adjectives (e.g., *aquí hay un ratón que persigue a un gato*). There are 17 sentences in total.

2.2.2.3 Morphologic integration (MI) task

This task assesses the ability to handle morphological grammatical rules, based on the participant verbally completing a sentence. The task is new, but was based on the Objective Criteria Language Battery morphology subtest (Puyuelo, Wiig, Renom, & Solanas, 1998). Some pictures were taken from the selection provided by Snodgrass and Vanderwart (1980).

The examiner shows a picture and says an unfinished sentence that the participant must complete with a word using the right inflection. The task consists of 31 items to assess the following topics: number morphemes (five items), with variable and invariable words accompanied by determiners (e.g., *éste es el barco y éstos son…*<u>*los barcos*</u>; *toma un*

paraguas más, y ya tienes tres paraguas); gender morphemes (five items), with variable and invariable words accompanied by determiners (*este niño es guapo y esta niña es…guapa; este niño está triste y esta niña también está…triste*); verbal morphemes according to the indicative mood of the verb (e.g., *en este dibujo el perro…come*;) or subjunctive mood (e.g. *esta niña desayunará cuando…se despierte*), the present, past, or future tense of the verb (e.g. *el payaso…va al circo; ayer también..fue; y mañana también…irá*), and the person performing the action (first, second, or third), with regular and irregular verbs (12 items); diminutive morphemes (e.g., *aquí hay una trompeta, y aquí hay una …trompetilla*) (two items); and morphemes that derive new words (e.g., *Ma-drid* and *madri-leño; llora* and *llor-ón*) (seven items).

2.2.2.4 Use of functional words (UFW) task

This task assesses the management of connective elements in sentence production: articles, prepositions, possessives, demonstratives, adverbs, and quantifiers. It is based on the "Grammar integration" of the ITPA (Kirk et al., 1986) and on the "Semantic" test from the Objective Criteria Language Battery (Puyuelo et al., 1998). Some pictures were taken from the selection provided by Snodgrass and Vanderwert (1980).

The participant has to complete sentences with the appropriate element in response to a drawing representing the utterance spoken by the examiner. In total, there were 43 items. The following elements were cued: prepositions (13) (e.g., *el hombre corta el pan con el cuchillo*); definite articles (three) (e.g., *aquí están los pantalones*); indefinite articles (three) (e.g., *esto es un coche*); possessive adjectives (three) (e.g., *ésa es mi muñeca*); possessive pronouns (three) (e.g., *es muñeca es mía*); demonstrative pronouns (three) (e.g., *el coche de Juan es…éste*); adverbs of place (six) (e.g., *el globo está…detrás de la casa*);

adverbs of time (four) (e.g., *la niña estudia primero, y la TV la verá…*<u>*después*</u>); and adverbs of quantity (five) (e.g. *en esta caja quedan…*<u>*muchos*</u> *bombones*).

2.2.2.5 Sentence production (PS) task

This task investigates syntactic production by the participant answering a question or completing an unfinished sentence. It is based on the syntax subtest from the Objective Criteria Language Battery (Puyuelo et al., 1998). The examiner presents the participant with a drawing of a scene to construct a sentence: There are six simple sentences in the active voice (e.g., *¿qué hace María aquí?* <u>*María come patatas*</u>); one coordinated sentence (e.g., *¿qué hacen Juan y María aquí?* <u>*Juan y María pintan un dibujo*</u>); and nine complex sentences: two causal (e.g., *la niña no puede comerse el pastel…*<u>*porque se lo ha comido el gato*</u>), one temporal (e.g., *los chicos saldrán al recreo…*<u>*cuando deje de llover*</u>), two final (*Juan come mucho…*<u>*para hacerse grande*</u>), two comparative (e.g., *el gato blanco es...*<u>*más grande que el gato negro)*</u>, and two relative adjectives (e.g., *aquí hay un árbol que tiene manzanas, y aquí…*<u>*hay otro que tiene peras*</u>). This task consists of 16 items.

2.2.3 Validity and Reliability

In this study, the construct validity of the linguistic battery was established using Pearson correlation coefficients. Correlations between the results of each phonological task and overall performance in phonological tasks showed high indexes of validity for SPD [$r(91) = .80; p < .00$], PHA [$r(91) = .82; p < .00$], SA [$r(91) = .72; p < .00$], R [$r(91) = .79; p < .00$], LD [$r(91) = .63; p < .00$], PHI [$r(91) = .86; p < .00$], DI [$r(91) = .75; p < .00$], and NWR [$r(91) = .59; p < .00$]. Using the same statistical procedure, the following indices were found in morphosyntactic tasks: SFI [$r(91) = .84; p < .00$], SU [$r(91) = .68; p < .00$], MI [$r(91) = .93; p < .00$], UFW [$r(91) = .89; p < .00$], PS [$r(91) = .73; p < .00$].

Cronbach's alpha was used to establish the reliability of the battery: alpha was .878 for the phonological tasks and .825 for the morphosyntactic tasks.

2.3 Method

The evaluation was conducted in the schools and each participant was assessed individually. Their participation was contingent on the provision of controlled conditions: adequate material resources, an appropriate place for the evaluation, noise isolation, and a lack of distractions. Each child was examined by a researcher previously trained in the assessment protocol. The researcher provided each participant with verbal instructions regarding the tasks. The pictures and drawings were presented on supplemental sheets. The results of assessing each participant were kept in a folder.

The tasks were administered in a random order. The average time for administration was 40 minutes. All the evaluations were performed during the school year (March to June).

3. Results

Table 3 shows the average performance by group on the phonological and morphosyntactic tasks.

Table 3. Means and standard deviation for each task by group

Task	SLI	CA	CL
SPD	24.68 (3.99)	27.23 (.92)	25.97 (2.18)
PHA	20.58 (3.13)	23.71 (1.10)	21.42 (3)
SA	18.55 (3.14)	22.58 (2.11)	19.32 (2.86)
R	19.58 (4.18)	22.90 (1.35)	19.71 (2.92)
LD	25.13 (4.45)	28.03 (1.96)	26.85 (2.95)
PHI	6.61 (4.17)	12.52 (2.79)	7.45 (4.33)
DI	11 (4.21)	17.26 (3.44)	14.52 (4.72)
NWR	19.65 (3.90)	21.61 (1.15)	21.03 (1.40)
SFI	19.68 (4.53)	26.19 (4.96)	21.35 (3.74)
SU	14.97 (1.22)	16.45 (.68)	14.94 (1.41)
MI	19.94 (5.24)	28.81 (3.82)	21.81 (7.19)
UFW	31.23 (6.54)	40.26 (4.29)	34.87 (5.76)
PS	12.52 (2.19)	15.16 (1.29)	13.13 (1.91)

Note. SLI: Specific language impairment group; CA: Control age sub-group; CL: Control language subgroup: SPD: Peer discrimination; PHA: Phonemic awareness; SA: Syllabic awareness; R: Rhyme; LD: Lexical decision; PHI: Phonemic integration; DI: Diadochokinesis; PSR: Nonword-repetition; SFI: Simple figures identification; SU: Sentences understanding; MI: Morphologic integration; UFW: Use of functional words; PS: Production of sentences.

3.1 Analysis of differences between groups

A MANOVA was used to compare the mean scores of the groups in the 13 linguistic tasks. Table 4 shows the results of the multiple post hoc comparisons (Bonferroni method).

Table 4. MANOVA: Differences among groups on the 13 psycholinguistic tasks. Multiple *post-hoc* comparisons (Bonferroni method).

Area	Task	Group (1)	Group (2)	Mean diff.(1-2)	p
PHONOLOGICAL	SPD	SLI	CA	-2,55	.001**
			CL	-1.29	.184
	PHA	SLI	CA	-3.13	.000**
			CL	-.84	.612
	SA	SLI	CA	-4.03	.000**
			CL	-.77	.805
	R	SLI	CA	-3.32	.000**
			CL	-.13	1
	LD	SLI	CA	-2.90	.002**
			CL	-1.73	.124
	PHI	SLI	CA	-5.90	.000**
			CL	-.84	1
	DI	SLI	CA	-6.26	.000**
			CL	-3.52	.004**
	NWR	SLI	CA	-1.97	.007**
			CL	-1.39	.092
MORPHOSYNTAX	SFI	SLI	CA	-6.52	.000**
			CL	-1.68	.421
	SU	SLI	CA	-1.48	.000**
			CL	.03	1
	MI	SLI	CA	-8.87	.000**
			CL	-1.87	.573
	UFW	SLI	CA	-9.03	.000**
			CL	-3.64	.037*
	PS	SLI	CA	-2.64	.000**
			CL	-.61	.575

Note. SLI: Specific language impairment group; CA: Control age sub-group; CL: Control language sub--group: SPD: Peer discrimination; PHA: Phonemic awareness; SA: Syllabic awareness; R: Rhyme; LD: Lexical decision; PHI: Phonemic integration; DI: Diadochokinesis; PSR: Nonword-repetition; SFI: Simple figures identification; SU: Sentences understanding; MI: Morphologic integration; UFW: Use of functional words; PS: Production of sentences. *p<.05; **p<.01

The SLI group performed significantly worse than the CA group on all eight tasks in phonology: Syllable pair discrimination; phonemic awareness; syllabic awareness; rhyme; lexical decision; phonemic integration; diadochokinesis; and nonword-repetition. Moreover, the SLI group also performed worse than the CL group on the diadochokinesis tasks.

The SLI group also performed worse than the CA group on all five morphosyntaxis tasks: Simple figure identification, sentence understanding, morphologic integration, use of functional words, and sentence production. On the other hand, the SLI group performed worse than the CL group on the use of functional words task alone.

In summary, the results indicate that the children with SLI performed worse than the children matched by chronological age on all the 13 tasks used in this study. The SLI group performed as well as children matched by linguistic age on two of the 13 tasks, but performed worse than these children on the other 11 tasks.

3.2 Stepwise Discriminant Analysis

A double analysis was used to determine discriminant functions (the two combinations of variables that best differentiated the SLI group from each of the control groups). A stepwise sequential method was followed.

The first analysis (SLI vs. CA) obtained the structural matrix in which the correlations between each variable and the function are represented. A discriminant function was established composed of three variables: Morphologic integration (r=.859); sentence understanding (r=.722); and diadochokinesis (r=.666). The function significantly discriminated the SLI group from the CA group [$\Lambda = .43$, $\chi 2(3) = 48.98$, $p < .000$],

explaining 56.7% of the between-group variance. Table 5 shows the sensitivity and specificity of the discriminant function between SLI versus CA: 26 out of 31 participants were correctly classified into the SLI group (sensitivity 83.9%) and 28 out of 31 participants into the CA group (specificity 90.3%).

The second analysis (SLI vs. CL) established a discriminant function composed of one variable: Diadochokinesis (r=.1). The results (Λ= .86, $\chi 2(1) = 8.80$, $p = .003$) indicate that the function explains 13.8% of the between-group variance. Table 5 shows the classification of the participants: 16 out of 31 participants were correctly classified into the SLI group (sensitivity 51.6%) and 19 out of 31 participants into the CL group (specificity 61.3%).

Table 5. Sentitivity and specificity of the discriminant functions between the groups

Groups	Discriminant function	Sensitivity	Specificity
SLI vs CA	Three tasks: Diadochokinesis Sentences understading Morphologic integration	83.9%	90.3%
SLI vs CL	One task: Diadochokinesis	51.6%	61.3%

Note. CA: Control age sub-group; SLI: Specific language impairment group.

4. Discussion

The main purpose of this study was to determine the psycholinguistic markers that best define the profile of Spanish-speaking children with SLI in phonology and morphosyntax. With this aim, a group of Spanish-speaking children with SLI was compared to two control subgroups: one matched by chronological age and another matched by psycholinguistic age. All the participants in the study were assessed with a battery of tasks that had been specifically designed for this study.

Regarding phonology, the results of the SLI group were significantly worse than those of the CA controls on all the tasks tested. Firstly, some of the phonological deficits can be explained by the theory of auditory processing deficits proposed by Tallal and colleagues (Tallal, 2000). From this point of view, children with SLI have deficient word perception, leading to erroneous representation and consequently erroneous production. Although there is a general consensus that SLI is a direct consequence of deficits in central auditory-perceptual processing, it seems plausible that impaired auditory skills may also contribute to limiting the phonological skills (see Ramus et al. 2002). Another of these limitations was clearly observed in the difficulties experienced by the SLI group in distinguishing monosyllabic words in phonological reception. This suggests that Spanish-speaking children with SLI have a deficit in their capacity to extract phonetic features of speech or a deficiency in the processing of speech sounds at the level of segmental identity; this possibility has also been raised by studies on English-speaking children with SLI (e.g., Burlingame, Sussman, Gillam, & Hay, 2005; Coady, Evans, Mainela-Arnold, & Kluender, 2007; and Ziegler, Pech-Georgel, George, Alario, & Lorenzi, 2005). Gallego, Revilla, & Schüller (2000) also suggest that Spanish-speaking children with SLI have difficulty retrieving phonological forms in these kinds of tasks.

Errors in perception and phonological representation imply that articulation is incorrect and resistant to change, even when the child's metalinguistic skills are increasing (Bryan & Howard, 1992). In this line, deficient auditory processing would also affect the analysis, interpretation, and use of all auditory information. If so, this would help to clarify why children with SLI have difficulties in segmenting learned words when performing phonological awareness tasks. Based on data from English-speaking children, problems in tasks such as phonemic awareness, syllabic awareness, and rhyme suggest a general deficit in phonological awareness (Thatcher, 2003), syllabic awareness (Escarce, 1998; Fazio, 1997a, 1997b; and Joffe, 1998) or in phonemic awareness (McArthur, 2004). Similar findings have been reported by de Barbieri & Coloma (2004), based on data from Spanish-speaking children.

In addition, deficits in phonological short-term memory capacity may also explain phonological awareness problems (e.g., Gathercole & Badeley, 1995). Word storage implies that the child memorizes the words in the same way they pronounce them, that is, as a complete unit (a template), including any errors that have been learned. On the other hand, it is accepted that metalinguistic skills follow a developmental process, such that children without language problems show a certain level of phonological awareness in the second year of life. Phonological awareness deficits in children with SLI suggest that this process does not occur and that these children have a mental representation of the word that is global (Fletcher, 1997), since they lack the ability to analyze the structural components (phonemes, syllables, and rhymes). Consistent with this, the results of this study show that children in the SLI group performed worse than children in the CA group in all the metalinguistic tasks and also that the younger children in the CL group had average results that were very similar to those of children with SLI. This suggests that young children

develop phonological awareness, offsetting the expected difference due to age, whereas children with SLI continue to show deficits or atypical ways of using words.

The poor execution of lexical decision tasks may simply be a consequence of an underspecification of phonological representations, as Maillart, Schelstraete, & Hupet (2004) have concluded in their studies with French-speaking children with SLI. In this regard, Metsala & Walley (1998) have also argued that there is a strong relationship between the development of phonological awareness skills and vocabulary in children. Based on this, children with SLI recognize words holistically and their difficulties in segmenting them lead to difficulties in distinguishing words from each other. Therefore, in order to increase the lexicon they need to be able to differentiate between words having similar phonological structures and that only differ, for example, by one or two phonemes. If this differentiation occurs then they can be correctly stored for their later recognition and recovery. This theoretical proposal suggests that the metalinguistic difficulties mentioned above may be linked to the difficulties in the lexical decision task shown by the children with SLI in this study.

Regarding phonological production, the current study confirms that the SLI group had deficits in the performance of sequences of sounds from an original structure, such as problems in the repeated articulation of a nonsense series of syllables. The children with SLI performed worse than the two control (CA and CL) groups in the verbal diadochokinesis task and thus the present study suggests that this task is a good marker of SLI. When practiced repeatedly, phonological skills facilitate the use of phonological working memory and the establishment of a lexical footprint, which appears to be very useful for successful language learning even in a language such as Spanish, which is syllabic and only has 5 vowels. The verbal diadochokinesis task involves the sequential

repetition of two or three vocally presented syllables without errors and at least three times for about 5 seconds. Ozanne (1995) noted that children with SLI failed in these types of tasks (similar to participants with dyspraxia) and proposed a subtype called "inconsistent phonological disorder" in which a deficit in the construction and maintenance of a phonological plan for words or syllables would be characteristic. Thus, failure in the diadochokinesis task suggests a mismatch between the lexical representation of the word and the execution of the selected articulatory pattern. This interpretation is supported by the work of Orsolini, Sechi, Maronato, Bonvino, & Corcelli (2001), who analyzed the errors made in simple syllabic structures by Italian-speaking children with SLI, finding that their slow articulatory development could limit their repertoire of vocal action.

Furthermore, it is assumed that the repeated sequences are in fact a type of repetition of nonwords and such repetition clearly interferes with working memory. This type of task was part of a neuropsychological assessment battery used in an experimental study in Finnish-speaking children with DLD (Korkman & Häkkinen-Rihu, 1994). The results had a high correlation with a repeating words and nonwords test.

The present study also shows the difficulties encountered by children with SLI in the specific nonword-repetition task. In this case, the SLI group also performed worse than the two control groups (CA and CL), although no significant effect was observed in the group of younger children. The latter finding may due to the fact that syllable length was set at three syllables. The number of syllables is one of the factors that could influence the ability to perform nonword-repetition tasks correctly (Ebert et al., 2008; Girbau & Schwartz, 2007). However, other studies have failed to support this finding. For example, Martínez et al. (2003) studied a group of 30 Spanish-speaking children with SLI (aged 5.0 to 5.11 years) and found that they performed worse on word and nonword repetition tasks than a

control group, but found no difference between groups in the number of syllables (length effect). In addition, several studies have noted that the complexity of the syllabic combinations may be another important factor (Graf Estes, Evans, & Else-Quest, 2007). In the Spanish language, some of these combinations may pose special difficulties regarding repetition, such as C-C-V syllables (for example, *pra-tar*) or C-V-C and C-C-V syllables occurring in the same word (for example, *cos-tru*). In the task used in this study, the inclusion of a reduced number of syllables in the construction of the initial items was based on attempting to motivate the younger children (5 years in both SLI and CL groups). Thus, the task was designed to be relatively uncomplicated at first, decrease the likelihood of giving up early, avoid frustration, and avoid a possible cognitive block in younger children. However, the degree of difficulty (and a possible floor-effect) of the short-nonword task was controlled by increasing its syllabic complexity. Thus, some nonwords contained only singleton consonants (e.g., *jata*, *lenego*), whereas others contained consonant clusters (e.g. *pratar*, *costru*).

In summary, the difficulties experienced by the SLI group in the last two tasks highlight the general limitations in the repetition of phonological structures and sounds without meaning, and support the frequent use of the nonword-repetition marker in research (e.g., Aguado et al., 2006, in Spanish-speaking children with SLI). As is well known, the theory of deficits in phonological short-term memory proposed by Gathercole and Baddeley assumes that a deficit in nonword repetition is a measure of this incapacity. In addition, Metsala & Walley (1998) have suggested that segmental representations influence the ability to repeat nonwords, because they are needed to correctly represent a nonword. This suggestion would provide a common connection between several of the deficits shown by the results of this study, and in which metalinguistic abilities would play an important role. Although

these tasks are considered low-level processes they have great predictive value because the lexical trace in auditory working memory in children with SLI appears to be less stable. In fact, several studies have noted that an understanding of verbal working memory has the greatest potential to aid in the development of models of language disorders (e.g., Engle, 2002; Leonard, Ellis Weismer, Miller, Francis, Tomblin, & Kail, 2007).

Regarding morphosyntaxis, our results show that the SLI group experienced more difficulty in recognizing and managing grammatical features than their age-matched peers with typical language development. This difficulty occurred in all tasks: oral comprehension, use of morphemes and inflections, the correct usage of functional words, and the grammatical structure of messages.

Firstly, regarding the two verbal comprehension tasks, several studies have shown how individuals with SLI experience particular difficulties in capturing the meaning of spoken sentences. In the simple figure identification task (similar to the Token-test), children with SLI showed clear signs of having problems in following the instructions on the nonverbal material. Given that in the task the SLI children had to remember and process verbal and nonverbal information, the data obtained are consistent with the general deficit in processing capacity proposed by Johnston (1992). The children gave evident signs of having difficulties in understanding syntactic structure while selecting, comparing, and organizing visual stimuli during the task.

Similarly, in the sentence understanding task, children with SLI performed worse than children in the CA group. In this activity, the child had to choose between four scenes and link one of them to the language information provided. The results replicate those of other studies on this topic in French-speaking children with SLI (Maillart & Schelstraete, 2002) and in English-speaking children with SLI (Montgomery, 2000; Montgomery & Evans.,

2009; van der Lely, 2005), and specifically in understanding temporal, causal, final, comparative, or reversible sentences (e.g., van der Lely & Stollwertck, 1996). These findings are consistent with what has been emphasized by other authors (van der Lely, 1994; van der Lely & Stollwertck, 1996); that is, that children with SLI have trouble grasping the meaning of complex sentences if there are few semantic indicators (such as a conjunction or a preposition alone), or if the sentence is reversible (as in the case of comparatives and passives). It should be noted that nonverbal and linguistic information was present in the two verbal comprehension tasks. The results of both tasks are compatible with an overall deficit in the capacity of representation, when visual and linguistic information has to be managed simultaneously (Johnston et al, 1988; Montgomery, 1993).

Secondly, during the production of utterances, these problems become more difficult as the complexity of the phrase increases; temporal, final, comparative, and relative constructions are particularly challenging. In contrast, children with SLI perform better in relation to simple and coordinated utterances. Similarly, Hincapie-Henao et al. (2008) found that Spanish-speaking children with SLI have great difficulty understanding complex morphosyntactic structures and verbally expressing formulated sentences. The results can be explained in the same way as the results of the sentence understanding task. In this regard, van der Lely & Stollwerck (1996) have highlighted persistent and disproportionate impairment in the grammatical comprehension and expression of language in children with SLI. In addition, van der Lely & Marshall (2011) have argued that these children use semantic mechanisms to compensate for their syntactic deficit, which could explain the frequency of simple sentences instead of complex sentences.

Thirdly, the group of children with SLI experienced their greatest difficulties in verbal inflexions of manner, time, and person – especially with irregular verbs – and in the

composition of derived words. In contrast, their performance was better in the use of gender and number morphemes, and in the inflection of diminutives. These results are in line with the abundant scientific literature on this issue. English-speaking children with SLI have more difficulties with verb inflections that with nominal morphemes (e.g., Bedore & Leonard, 1998; Rice, 2003). Similar results have been demonstrated in in German-speaking children (e.g., de Jong, 2003). Several studies on Spanish, French, and Italian children with SLI have found that they make errors with verb morphology marking person, number, and tense (e.g., Bedore & Leonard, 2001; Bortolini, Caselli, Deevy, & Leonard, 2002; Bortolini, Caselli, & Leonard, 1997; Jakubowitcz & Nash, 2001; Paradis & Crago, 2001). On the other hand, in this study, the SLI group performed worse than the CA group and the CL group on the use of functional words task (articles, prepositions, possessives, demonstratives, adverbs, and quantifiers). Some studies on these Romance languages (Spanish, French, and Italian) have shown that children with SLI have difficulty with object clitics (e.g., Bedore & Leonard, 2001; Bortolini et al., 2002; Gruter, 2005; Paradis, 2004). In addition, article errors are characteristic of Spanish-speaking children and Italian-speaking children.

Generally, the results of tasks involving the use of several different grammatical morphemes and functional words are consistent with those of other studies on Spanish-speaking children with SLI. For example, this can be seen in studies on the use of verbal inflections (e.g., Bedore & Leonard, 2001; Grinstead et al., 2012; Sanz-Torrent et al., 2008; Simon-Cereijido, 2009), and in studies on the use of articles or clitic pronouns (e.g., Anderson, 2001; Anderson & Lockowitz, 2009; Anderson & Souto, 2005; Bedore & Leonard, 2005; Bosch & Serra, 1997; De la Mora Gutierrez, 2004; Serra, 2002). In Spanish-English bilingual children, studies have demonstrated difficulties in both

languages with article use, prepositional phrases, relative clauses, and use of negatives (Gutierrez-Clellen, Restrepo, & Simon Cereijido, 2006; Gutierrez-Clellen & Simon Cereijido, 2007). Specifically, in the Spanish language, young school age Spanish-English bilingual children may make mistakes with clitics, gender agreement with articles, and person number with verbs (Bedore & Peña, 2008; Simon Cereijido & Gutierrez-Clellen, 2007).

In this study, children with SLI performed worse than their younger, linguistically-matched peers on the use-of-functional words task. This result suggests that this marker is one of the most powerful indicators for defining the SLI profile at the morphosyntactic level. In summary, these results confirm the particular difficulties experienced by children with SLI in the area of morphosyntax. Regarding specific language impairment across languages, Leonard suggested that many crosslinguistic generalizations can be made regarding the use of grammatical morphology by children with SLI (Leonard, 1998, 2000). His results are consistent with theories that suggest that SLI involves characteristic deficits in this linguistic area. The "surface hypothesis" (Leonard, 1989) offers an explanation of these deficits: children with SLI will produce phonologically low-weight items with difficulty, including derivatives and clitic morphemes. A different explanation suggests that there is a deficit in the acquisition of implicit grammatical rules or "blindness" regarding these specific characteristics (Gopnik, 1990, 1994; Ullman & Gopnik, 1999) and that linguistic markers are "vulnerable" in these children (Bishop, 1994).

Additionally, the identification in the current study of two canonical functions increases its value in two ways. The first canonical function was the linear combination of tasks that could best differentiate children with SLI from their age-matched peers. This function combines the results of three tasks and could form the basis for the development of a

screening tool for the differential diagnosis of SLI by evaluating the three psycholinguistic markers: phonoarticulatory diadochokinesis, sentence understanding, and morphologic integration. The discriminant analysis obtained a function with acceptable coefficients of sensitivity and specificity for the detection of children at risk of SLI (up to 8 years of age). The second canonical function was the linear combination of tasks to differentiate children with SLI from their linguistically-matched peers. A screening procedure was obtained that only used the combination of outcomes in one task: phonoarticulatory diadochokinesis. The coefficients of sensitivity and specificity indicate that this screening procedure is not suitable for differentiating children with SLI from younger peers with typical language development.

In other words, the group of children with SLI performed worse than their peers in the CL group in this task (phonoarticulatory diadochokinesis), but this test alone is not sufficiently robust to discriminate children with SLI from younger children. In fact, its sensitivity was only 51.6%. When classifying new cases, a screening procedure using the diadokokinesis test does not guarantee whether a child has SLI or whether the child is still too young (5 to 6 years) to perform the task. It can be inferred that the similarity of psycholinguistic age levels between groups requires the differential diagnosis of SLI vs CL to be more detailed and have a larger number of indicators. That is, the screening procedure may not be appropriate to separate children with SLI from younger children, as their linguistic performance profile overlaps in a large number of areas and levels. Therefore, the screening method is not as effective when applied to the younger CL controls (between 5 and 6 years of age) where a low specificity index of the tasks elicits a high number of false positives (children with typical language development who are linguistically similar to children with SLI).

5. Conclusions and Limitations

The analysis of the relationships between tasks and functions shows that the markers of Spanish-speaking children with SLI are defined as specific deficits in the following areas: auditory discrimination, phonological working memory, phonological awareness, lexical access, phonological programming, articulatory praxis, and recognition and management of grammatical resources. The fact that some language skills in children with SLI are also weaker than those in younger peers with typically language development suggests that of all the deficits identified, those considered the most problematic are related to phonological working memory and the use of connective elements. Diadochokinesis and the use-of-functional-words tasks may be the most important markers in the diagnosis of Spanish-speaking children with SLI.

The battery of tasks applied in this study could be used to establish differential psycholinguistic markers in phonology and morphosyntax. Moreover, the results obtained support the capacity of part of this battery as a screening method to differentiate Spanish-speaking children with SLI from controls. However, it is easier to differentiate between children up to 8 years of age than between younger children. In the latter case, some children with SLI are very similar to younger children regarding the combination of variables in the discriminant function, indicating a large degree of crossover, and thus a deeper, more detailed diagnostic procedure would be required.

Nevertheless, we acknowledge that this study has some limitations. For example, a more accurate profile of SLI children would have been obtained if the study had included other diagnostic tests for sample selection. Furthermore, a more sophisticated methodology could have been used to reduce the number of participants in order to obtain well-defined groups

of children with SLI or typical language development. A different set of tasks may have improved the results of the present study and could also be used in future studies.

Finally, the results of this study can benefit educational and clinical practice by facilitating the establishment of a set of markers and tasks for the diagnosis of SLI in educational evaluation contexts and clinical settings. In addition, future research should define these markers more clearly and refine the procedures for their use in the differential diagnosis of this disorder. This study could clearly be extended to semantic and pragmatic areas to establish differential psycholinguistic markers for children with SLI in these areas.

References

Aguado, G., Cuetos, F., Domezáin, M., & Pascual B. (2006). Repetición de pseudopalabras en niños españoles con trastorno específico del lenguaje: marcador psicolingüístico. *Revista de Neurología, 43*, 201-208.

Aguilar, E.M. (2002). Diagnóstico diferencial precoz entre el trastorno del lenguaje y el retraso del lenguaje a partir de los procesos de simplificación fonológica. *Revista de Logopedia, Foniatría y Audiología, 22*, 90-99.

Aguilar-Mediavilla, E., Sanz-Torrent, M. & Serra-Raventos, M. (2007). Influence of phonology on morpho-syntax in Romance languages in children with Specific Language Impairment (SLI). *International Journal of Language and Communication Disorders, 42,* 325-347.

American Psychiatric Association (1994). *Diagnóstic and statistical manual of mental disorders*: *DSM-IV*. Washington: American Psychiatric Association.

Anderson, RT. (2001). Learning an invented inflectional morpheme in Spanish by children with typical language skills and with specific language impairment (SLI). *International Journal of Language and Communication Disorders, 36,* 1-19.

Anderson, R.T. & Lockowitz, A. (2009). How do children ascribe gender to nouns? A study of Spanish-speaking children with and without specific language impairment. *Clinical Linguistics and Phonetics, 23,* 489-506.

Anderson, R.T. & Souto, S.M. (2005). The use of articles by monolingual Puerto Rican Spanish-speaking children with specific language impairment. *Applied Psycholinguistics, 26* (4), 621-647.

Andreu, Ll., Sanz-Torrent, M., Guardia-Olmos, J., & Macwhinney, B. (2011). Narrative comprehension and production in children with SLI: An eye movement study. *Clinical Linguistics and Phonetics, 25* (9), 767-783..

Augusto, J.M., Adrián, J.A., Alegría, J., & Martínez de Antoñana, R. (2002). Dificultades lectoras en niños con sordera. *Psicothema, 14*, 746-743.

Bedore, L.M., & Leonard, L.B. (1998). Specific language impairment and grammatical morphology: A discriminant function analysis. *Journal of Speech, Language, and Hearing Research, 41,* 965-1220.

Bedore, L.M., & Leonard, L.B. (2001). Grammatical morphology deficits in Spanish-speaking children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 44*, 905-20.

Bedore, L.M., & Leonard, L.B. (2005). Verb inflections and noun phrase morphology in the spontaneous speech of Spanish-speaking children with specific language impairment. *Applied Psycholinguistics, 26,* 195-225.

Bedore, L. M., & Peña, E. D. (2008). Assessment of bilingual children for identification of language impairment: Current findings and implications for practice. International *Journal of Bilingual Education and Bilingualism, 11,* 1-29.

Bishop, D.V.M. (1994). Grammatical errors in specific language impairment: Competence or performance limitations? *Applied Psycholinguistics, 15*, 507-550.

Bortolini, U., Caselli C.M., Deeby, D.P. & Leonard, L.B. (2002). Specificic language impairment in Italian: firts steps in the search of a clinical marker. *International Journal of Language and Communication Disorders, 37,* 77-93.

Bortolini U., Caselli, M.C. & Leonard, L. (1997). Grammatical deficits in Italian-speaking children with specific language impairment. *Journal of Speech and Hearing Research, 40* (4), 809-820.

Bortolini, U. & Leonard, L.B. (2000). Phonology and children with specific language impairment: Status of structural constraints in two languages. *Journal of Communication Disorders, 33,* 131-150.

Bosch, L., & Serra, M. (1997). Grammatical morphology deficits of Spanish-speaking children with specific language impairment. In A. Baker, M. Beers, G. Bol, J. de Jong & G. Leemans (Eds.), *Child language disorders in a cross-linguistic perspective. Amsterdam Series in Child Language Development* (pp.33-45). Amsterdam: University van Amsterdam.

Brown, L., Sherbenou, R., & Johnsen, S. (1995). *Test de inteligencia no verbal TONI2.* Madrid: TEA.

Bryan, A. & Howard, D. (1992). Frozen phonology thawed: the analysis and remediation of a developmental disorder of real word phonology. *European Journal of Disorders of Communication, 27,* 343-365.

Burlingame, E., Sussman, H.M., Gillam, R.B., & Hay, J.F. (2005). An investigation of speech perception in children with specific language impairment on a continuum of formant transition duration. *Journal of Speech, Language, and Hearing Research, 48,* 805-917.

Coady, J.A., Evans, J.L., Mainela-Arnold, E., & Kluender, K.R. (2007). Children with specific language impairments perceive speech most categorically when tokens are natural and meaningful. *Journal of Speech, Language, and Hearing Research, 50,* 41-58.

de Barbieri, Z., & Coloma, C. J. (2004). La conciencia fonológica en niños con trastorno específico del lenguaje. *Revista de Logopedia, Foniatría y Audiología, XXIV* (4), 156-163.

de Jong, J. (2004). Grammatical impairment: An overview and sketch of dutch. In L. Verhoeven and H. van Balkom (Eds.), *Classification of developmental language disorders. Theoretical issues and clinical implications* (pp. 261-281*).* London: Lawrence Erlbaum Associates.

de la Mora, J. (2004). *Direct object clitics in Spanish-speaking children with and without specific language impairment.* Alberta: University of Alberta

di Renzi, E., & Vignolo, L. (1962). The Token Test. A sensitive test to detect receptive disturbances in aphasics. *Brain, 85,* 665-678.

di Simoni, F. (1978). *The Token Test for Children.* Hingham, M.A: Teaching Resources.

Dollaghan, C. (1998). Spoken word recognition in children with and without specific language impairment. *Applied Psycholinguistics, 19,* 193-207.

Ebert, K., Kalanek, J., Cordero, K. & Kohnert, K., (2008). Spanish non-word repetition stimuli development and preliminary results. *Communication Disorders Quarterly, 29* (2), 67-74.

Engle, R. (2002). Working memory capacity as executive attention. *Current Directions in Psychological Science, 11,* 19-23.

Escarce, M.E.W. (1998). Toddlers with specific expressive language impairment: Reading outcomes to age 8. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58 (8-B),* 4490.

Fazio, B.B. (1997a). Memory for rote linguistic routines and sensitivity to rhyme: A comparison of low-income children with and without specific language impairment. *Applied Psycholinguistics, 18,* 345-372.

Fazio, B.B. (1997b). Learning a new poem: Memory for connected speech and phonological awareness in low-income children with and without specific language impairment. *Journal of Speech and Hearing Research, 40,* 1285-1297.

Fletcher, P. (1992). Subgroups in school-age language-impaired children. In P. Fletcher & D. Hall (Eds.), *Specific speech and language disorders in children: Correlates, characteristics and outcome* (pp.152-165). London, Whurr.

Gallego, C., Revilla, P. & Schüller, M. T. (2000). Recuerdo de material verbal en niños con disfasia funcional. *Cognitiva, 12,* 37-61.

Gathercole, S.E. & Baddeley, A.D. (1995). Short term memory may yet be deficient in children with language impairments: A comment on Van der Lely & Howard (1993). *Journal of Speech and Hearing Research, 38,* 463-466.

Girbau, D.& Schwartz, R.G. (2007). Non-word repetition in Spanish-speaking children with Specific Language Impairment (SLI). *International journal of Language and Communication Disorders, 42* (1), 59-75.

Girbau, D.& Schwartz, R.G. (2008). Phonological working memory in Spanish-English bilingual children with and without specific language impairment. *Journal of Communication Disorders, 41* (2), 124-145.

Gopnik, M. (1990). Feature blindness: a case study. *Language Adquisition, 1,* 139-164.

Gopnik, M. (1994). The family. *McGill Working Papers in Linguistics, 10,* 1-4.

Gutierrez-Clellen, V., Restrepo, M.A., & Simon-Cerejido, G. (2006). Evaluating the discriminant accuracy of grammatical measures with Spanish-speaking children.

Journal of Speech, Language, and Hearing Research, 49, 1209-1223.

Gutierrez-Clellen, V.F. & Simon-Cereijido, G. (2007). The discriminant accuracy of a grammatical measure with Latino English-speaking children. *Journal of Speech, Language, and Hearing Research, 50,* 968-981.

Graf Estes, K., Evans, J.L., Else-Quest, N.M. (2007). Differences in the nonword repetition performance of children with and without specific language impairment: a meta-analysis. *Journal of Speech and Hearing Research, 50,* 177-195.

Grinstead, J., Baron, A., Vega-Mendoza, M., De la Mora, J., Cantú-Sánchez, M. & Flores, B. (2013). Tense Marking and Spontaneous Speech Measures in Spanish SLI: A Discriminant Function Analysis. *Journal of Speech, Language, and Hearing Research, 56,* 352-363.

Grüter, T. (2005). Comprehension and production of French object clitics by child second language learners and children specific language impairment. *Applied Psycholinguistics*, *26,* 363–392.

Hincapié-Henao, L., Giraldo-Prieto M., Lopera-Restrepo, F., Pineda-Salazar, D.A., Castro-Rebolledo, R., Lopera-Vásquez, J.P., Mendieta-Villamizar, N.S., Jaramillo-Pérez, A.M., Arboleda-Ramirez, A., Aguirre-Acevedo, D.C., & Lopera-Echeverri, E. (2008). Trastorno Específico del Desarrollo del Lenguaje en una población infantil colombiana. *Universitas Psychologica, 7,* 557-569.

Jakubowicz, C. & Nash, L. (2001). Functional categories and syntactic operations in (Ab)normal language acquisition. *Brain and Language, 77,* 321-339.

Joffe, V.L. (1998). Rhyming and related skills in children with specific language impairment. *Current Psychology of Cognition, 17,* 479-512.

Kay, J., Lesser, R. & Coltheart, M. (1992). *Psycholinguistic Assessment of Language Processing in Aphasia (PALPA): Introduction*. UK: Lawrence Erlbaum Associates, Publishers.

Kirk, S.A., McCarthy, J.J., & Kirk, W.D. (1986). *Test Illinois de aptitudes psicolingüísticas.* . Madrid: TEA.

Korkman, M., & Häkkinen-Rihu, P. (1994). A new classification of developmental language disorders (DLD). *Brain and Language, 47*, 96-116.

Leonard, L.B. (1989). Language learnability and specific language impairment in children. *Applied Psycholinguistics, 10*, 179-202.

Leonard, L.B. (1995). Functional categories in the grammars of children with specific language impairment. *Journal of Speech and Hearing Research, 38*, 1270-1283.

Leonard, L.B. (1998). *Children with specific language impairment*. Cambridge (MA): MIT Press.

Leonard, L.B. (2000). Specific language impairment across languages. In D.V.M Bishop y L.B. Leonard (Eds.), *Speech and Language Impairment in Children* (pp. 115-129). Hove: Psychology Press Ltd.

Leonard, L.B. (2009). Some reflections on the study of the children with specific language impairment. *Child Language and Therapy, 25,* 169-171.

Leonard, L.B. & Bortolini, U. (1998). Grammatical morphology and the role of weak syllables in the speech of Italian-speaking children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 41,* 1363-1374.

Leonard, L.B., Ellis Weismer, S., Miller, C.A., Francis D.J., Tomblin, J.B., & Kail, R.V. (2007). Speed of processing working memory, and language impairment in children. *Journal of Speech, Language, and Hearing Research, 42,* 678-689.

Leonard, L., Eyer, J., Bedore, L. & Grela, B. (1997). Three accounts of the grammatical morpheme difficulties of English-speaking children with specific language impairment. *Journal of Speech and Hearing Research, 40* (4):741-753.

Maillart, C., & Schelstraete, M. (2002). Morphosyntactic problems in children with specific language impairment: Gramatical SLI or overload in working memory? *Investigations in clinical phonetics and linguistics*, 85-97.

Maillart, C., Schelstraete, M., & Hupet, M. (2004). Phonological representations in children with SLI: a study of French. . *Journal of Speech, Language, and Hearing Research, 47,* 187-198.

Martínez, L., Bruna, A., Guzmán, M., Herrera, C., Valle, V. & Vázquez, M. (2001). El efecto de recencia y el efecto de metría en la memoria de trabajo fonológica en niños con trastorno específico moderado del lenguaje. *Revista Chilena de Fonoaudiología*, *2*, 19-30.

Martínez, L., Bruna, A., Guzmán, M., Herrera, C., Valle, V. & Vázquez, M. (2002). Alteraciones en las representaciones fonológicas en la memoria de trabajo en niños preescolares con TEL. *Revista de Logopedia, Foniatría y Audiología, 22*, 181-189.

Martínez, L., Herrera, C., Valle, J. & Vázquez, M. (2003). Memoria de trabajo fonológica en preescolares con trastornos especifico del lenguaje expresivo. *PSYKHE, 12* (2), 153-162.

Martínez, J.A. & García, O. (2004). *Diccionario de frecuencias del castellano escrito en niños de 6 a 12 años.* Salamanca: Publicaciones Universidad Pontificia de Salamanca.

McArthur, G.M., & Bishop, D.V.M. (2004). Frequency discrimination deficits in people with specific language impairment: Reliability, validity, and linguistic correlates. *Journal of Speech, Language, and Hearing Research*, 47, 527-541.

McGregor, K.K., Newman, R.M., Reilly, R.M., & Capone, N. (2002). Semantic representation and naming in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *45*, 998-1014.

Mendoza, E., Carballo, G., Muñoz J., & Fresneda, M.D. (2005). *CEG. Test de comprensión de estructuras gramaticales.* Madrid: TEA Ediciones.

Metsala, J.L. & Walley, A.C. (1998). Spoken vocabulary growth and the segmental restructuring of lexical representations: precursors to phonemic awareness and early reading ability. In J.L. Metsala & L.C Ehri (Eds.), *Word recognition in beginning literacy.*(pp. 89-120). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Montgomery, J.W. (2000). Verbal working memory and sentence comprehension in children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 43,* 293-308.

Montgomery, J.W., & Evans, J.L. (2009) Complex sentence comprehension and working memory in children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 52*, 269-288.

Nieto-Herrera, M.E. (1984). *Exploración del nivel lingüístico en edad escolar: Prueba de lenguaje oral M.E.N.H.* México, D.F.: Francisco Méndez Oteo.

Orsolini M., Sechi E., Maronato C., Bonvino E.,& Corcelli A. (2001). Nature of phonological delay in children with specific language impairment. *International Journal of Language and Communication Disorders, 36,* 63-90.

Ozanne, A. (1995). The search for Developmental Verbal Dyspraxia. In B. Dodd (Ed.), *Differential diagnosis and treatment of children with speech disorder* (pp. 91–109). Londres: Whurr Pub.

Paradis J. (2004). The relevance of specific language impairment in understanding the role of transfer in second language acquisition. *Applied Psycholinguistics, 25*, 67–82.

Paradis J, Crago M. (2004). Comparing L2 and SLI grammars in French: Focus on DP. In Prévost P. and Paradis J. (Eds), *The acquisition of French in different contexts: Focus on functional categories* (pp. 89-108). John Benjamins: Amsterdam.

Puyuelo, M., Wiig, E., Renom, J., & Solanas, A. (1998). *Batería del lenguaje objetiva y criterial.* Barcelona: Masson.

Ramus, F., Rosen, S., Dakin, S. C., Day, B. L., Castellote, J. M., White, S., & Frith, U. (2002). Theories of developmental dyslexia: Insights from a multiple case study of dyslexic adults. *Brain, 126*, 841–865.

Records, N., & Tomblin, B. (1994). Clinical decision making: describing the decision rules of practicing speechlanguage pathologists. *Journal of Speech and Hearing Research, 37*, 144–156.

Restrepo, M.A. (1998). Identifiers of predominantly Spanish-speaking children with language impairment. *Journal of Speech, Language, and Hearing Research, 4,* 1398-1411.

Restrepo, M.A. & Gutiérrez-Clellen, V.F. (2004). Grammatical impairments in Spanish-English bilingual children. In B. Golstein (Ed.), *Bilingual Language Development and Disorders in Spanish-English Speakers* (pp. 213-234). Baltimore: Paul Brooks.

Rice, M.L. (2003). A unified model of specific and general language delay: Grammatical tense as a clinical marker of unexpected variation. In Levy Y., Schaeffer J. (Eds.*), Language competence across populations: Towards a definition of Specific Language Impairment* (pp. 63-94). Lawrence Erlbaum: Mahwah, NJ.

Rosen, S. (2003). Auditory processing in dyslexia and specific language impairment: is there a deficit? What is its nature? Does it explain anything? *Journal of Phonetics 31*, 509–527.

Sanz, M. (2002). Los verbos en los niños con trastorno del lenguaje. *Revista de Logopedia, Foniatría y Audiología, 22*, 100-110.

Sanz-Torrent, M., Serrat, E., Andreu, L. & Serra, M. (2008). Verb morphology in Catalan and Spanish in children with Specific Language Impairment: a developmental study. *Clinical Linguistics & Phonetics 22* (6), 459-474

Serra, M. (2002). Trastornos del Lenguaje: preguntas pendientes en investigación e intervención. *Revista de Logopedia, Foniatría y Audiología, XVII* (2), 63-76.

Serra, M., Aguilar, E.M. & Sanz, M. (2002). Evolución del perfil productivo en el trastorno del lenguaje. *Revista de Logopedia, Foniatría y Audiología, 22*, 77-89.

Simon-Cereijido, G. (2009). Verb argument structure deficits in Spanish-speaking preschoolers with specific language impairment who are English language learners. UC San Diego *Electronic Theses and Dissertations.* http://escholarship.org/uc/item/0hx3w1f1. Local Identifier: b6844883.

Simon-Cereijido, G. & Gutierrez-Clellen, V. F. (2007). Spontaneous language markers of Spanish language impairment. *Applied Psycholinguistics, 28* (2), 317-339.

Snodgrass, J.G, & Vanderwart, M. (1980). A standardized set of 260 pictures: norms for name agreement, image agreement, familiarity and visual complexity. *Journal of Experimental Psychology: Human, learning and memory, 6* (2), 174-215.

Tallal, P. (2000). Experimental studies of language learning impairments: from research to remediation. In D.V.M Bishop y L.B. Leonard (Eds.), *Speech and Language Impairment in Children* (pp. 131-155). Hove: Psychology Press.

Tannock, R. (2013). Rethinking ADHD and LD in DSM-5: Proposed Changes in Diagnostic Criteria. *Journal of Learning Disabilities, 46*(1), *5–25*

Thatcher, K.L. (2003). Phonological awareness in children with specific language impairment. *Dissertation Abstracts International Section B: The Sciences and Engeenering, 64 (5-B),* 2158.

Ullman, M. T. & Gopnik, M. (1999). Inflectional morphology in a family with inherited specific language impairment. *Applied Psycholinguistics, 20,* 51-117.

Valle F. & Cuetos F. (1995). *EPLA: Evaluación del Procesamiento Lingüístico en la afasia.* London: Lawrence Erlbaum.

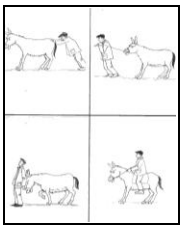
van der Lely, H.K.J. (1994). Canonical linking rules: forward versus reverse linking in normally developing and specifically language-impaired children. *Cognition, 51,* 29-72.

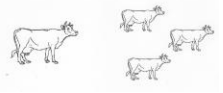
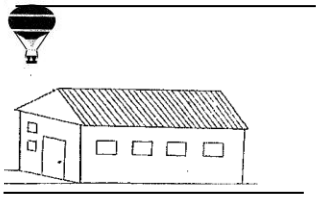
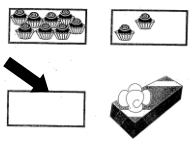
van der Lely, H.K.J. (2005). Domain-specific cognitive systems: insight from Grammatical-SLI. *Trends in Cognitive Sciences, 9,* 53-59.

van der Lely, H. K., & Marshall, C. R. (2011). Grammatical-specific language impairment: A window onto domain specificity. In J. Gouendouzi, F. Loncke & M.J. Williams (Eds.), *The handbook of psycholinguistics and cognitive processes: Perspectives in communication disorders* (pp. 401-418). New York: Psychology Press.

van der Lely, H.K.J., & Stollwerck, L. (1996). A grammatical specific language impairment in children: An autosomal dominant inheritance? *Brain and Language, 52,* 484-504.

Ziegler, J.C., Pech-Georgel, C., George, F., Alario, F.X. & Lorenzi, C. (2005). Deficits in speech perception predict language learning impairment. *Proceedings of the National Academy of Sciences of the United States of America, 102,* 14110-5.

APPENDIX: BATTERY OF PSYCHOLINGUISTIC TASKS (1/2)	
TASK	**SAMPLE ITEM**
Syllable pair discrimination (SPD)	*fe-fe; tas-pas; mal-mar; sol-los*
Phonemic awareness (PHA)	*moto-mano; seta-búho; bota-pomo* (bike-hand); (mushroom-owl); (boot-handle)
Syllabic awareness (SA)	*rana-dedo; boca-pozo; mano-martillo* (frog-finger); (mouth-well); (hand-hammer)
Rhyme (R)	*maleta-trompeta; peine-brazo; pimiento-serpiente* (suitcase-trumpet); (comb-arm); (pepper-snake)
Lexical decision (LD)	*chipera; sol; poder; ayuda; enamorado*
Phonemic integration (PHI)	Original / Change / Result *das* / *a*i* / *dis* *fiel* / *f*m* / *miel* *bas* / *a*o; b*n* / *nos*
Diadochokinesis (DI)	*me-ne; pa-ba-ma; es-ez; ble-gre*
Nonword-repetition (NWR)	*cro; mebo; ponta; fasten*
Token test (TK)	*Toca un círculo* (Touch a circle) *Toca el círculo rojo* (Touch the red circle) *Toca el cuadrado azul pequeño* (Touch the small blue square) 
Sentence understanding (SU)	*El hombre empuja al burro* (The man pushes the donkey)  *La niña da caramelos al niño porque tiene muchos* **(**The girl gives candies to the boy because she has a lot) 

APPENDIX: BATTERY OF PSYCHOLINGUISTIC TASKS (2/2)	
TASK	**SAMPLE ITEM**
Morphologic integration (MI)	*Ésta es la vaca. Éstas son…LAS VACAS.* (This is the cow. These are ...the cows)  *Éste es el gallo. Ésta es…LA GALLINA.* (This is the rooster. This is ... the chicken)  *El niño duerme. Ayer yo también…DORMÍ.* (The child sleeps. Yesterday I also… slept)  *Aquí hay un gato y aquí hay…UN GATITO.* (Here's a cat and here's a… kitten)  *El niño llora mucho. Es un…LLORÓN.* (The boy cries a lot. He's a…crybaby) 
Use of functional words (UFW)	*Bebemos EN el vaso* (People usually drink from the glass → It is a free translation, no literal, from the Spanish)  *El globo está ENCIMA de la casa* (The balloon is over the house)  *En esta caja no queda NINGÚN bombón* (There are no more chocolates in this box) 
Production of sentences (PS)	*¿Qué hace Juan?JUAN SE PEINA* (What is John doing? John is combing his hair)  *Juan llora…PORQUE LE HA MORDIDO EL PERRO* (John is crying ... because the dog has bitten him)  *El niño saca la entrada… PARA IR AL CIRCO.* (The child takes the ticket... to go to the circus)