DOES L2 WORD DECODING IMPLY L2 MEANING ACTIVATION? RELATIONSHIPS AMONG DECODING, MEANING IDENTIFICATION, AND L2 ORAL LANGUAGE PROFICIENCY IN READING SPANISH AS A SECOND LANGUAGE

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This study investigated the role of meaning activation and L2 oral language proficiency among Moroccan children learning to read in Spanish for the first time. Recent cross-linguistic research suggests that children learning to read in an L1 or L2 transparent orthography can achieve phonological decoding accuracy faster by relying on grapheme-phoneme strategies. In that case, it becomes extremely important to investigate the role of meaning and its relation to the development of phonological decoding and reading comprehension, especially when children are learning to read in an L2 transparent orthography. The main objective of this study was to discover whether phonological decoding and meaning identification can be considered to be two independent constructs or only one. The second objective was to expand the scope of L2 Spanish oral language proficiency by examining its influence on each of these constructs and on sentence reading comprehension.

A battery of measures for assessing the various domains of phonological awareness, decoding, meaning identification and sentence comprehension, were administered to 140 Moroccan children with at least one year of literacy instruction in Spain. Letter knowledge and concept of print were used as control variables. Confirmatory analysis results demonstrated that decoding and word identification form different but dependent constructs. Structural equation modeling indicated that the contribution of L2 oral language proficiency depended on the exact nature of the dependent variable: L2 oral language proficiency does not directly predict decoding skills but is directly related to meaning identification skills and sentence comprehension.

The findings provided an understanding of the roles of meaning and L2 oral language proficiency in isolated word reading and sentence comprehension, and clearly implied that decoding and comprehension are more independent when learning to read in an L2 transparent orthography. L2 decoding in Spanish can take place without comprehension. Possible theoretical, instructional and assessment implications related to L2 Spanish reading development are drawn based on the study’s results.

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ABBREVIATIONS, CONSTRUCT DEFINITIONS AND VARIABLE NAMES

χ^2: Chi-square.

AVE: Average variance extracted.

Blending: Observed variable which requires the ability to manipulate the phonemes of the spoken word.

CFA: Confirmatory Factor Analysis.

CFI: Comparative Fit Index.

Concept about print: Children's knowledge about how the act of reading is carried out.

ESL: English as a second language.

GPC: Grapheme-phoneme correspondence.

GFI: Goodness-of-fit index.

Intra-syllabic awareness (IN.SY.PA): The ability to identify the intrasyllabic elements of the spoken word.

L1: First Language.

L2: Second Language.

Listening Comprehension (List-comp): Observed variable which requires the ability to comprehend oral language in context.

NNFI: Non-Normed fit index.

Oral language proficiency (OLP): OLP is a wide construct which is normally defined as the ability to comprehend and to communicate language orally. This involves both receptive and productive skills, but as reading is a receptive process, we will concentrate mostly on two receptive skills: listening comprehension and oral language vocabulary.

Oral vocabulary (Oral.voc): Observed variable which requires the ability to recognize orally the phonological label of a word and then associate it with a concept.

PCA: Principal Component Analysis.

PGC: Phoneme-grapheme correspondence.

PGST: Psycholinguistic Grain Size Theory.

Phonological awareness (PA): Phonological awareness refers to skills that involve attending to, thinking about, and intentionally manipulating the phonological aspects of the spoken language (Liberman, 1992). It has also been demonstrated that identification and manipulation at the level of phonemes is highly dependent upon and confounded with letter knowledge (Stahl & Murray, 1992). Therefore, in order to avoid confounding factors, PA has been divided into two sets: intra-syllabic awareness and blending.

Phonological decoding: The ability to pronounce words and pseudo-words when seen in print.

PPVT-R: Peabody Picture Vocabulary Test-Revised.

R-NNFI: Satorra-Bentler Non-Normed Fit Index

Reading vocabulary (read.voc): Observed variable which requires the ability to map a written word with three possible pictures.

RMR: Root mean square residual.

RMSEA: Root mean square error of approximation.

S-B χ^2: Satorra-Bentler scaled chi-square.

SEM: Structural Equation Modeling.

Sentence comprehension: The ability to understand information from a sentence and to interpret it appropriately.

Spanish letter knowledge: Identifying the names of the letters and the sounds they represent.

SRMR: Standardized Root Mean Square Residual.

TVIP: Test de vocabulario en imágenes.

Word identification: The retrieval of a phonological form and the activation of the meaning of a word seen in print.

Word-picture matching (Word-pic): Observed variable which requires the ability to match three possible words with the corresponding picture.

1.0 INTRODUCTION

The main goal of this study is to find out whether decoding abilities in Spanish as a second language imply meaning access. A review of the literature will demonstrate that phonological decoding skills and meaning activation skills in Spanish as a second language can be regarded as more independent constructs than in English as a second language. Therefore, measures of L2 word recognition ability in Spanish should take into account both components.

Research on L2 literacy development with minorities has almost exclusively focused on English orthography. This focus can be seen as a serious limitation in the implications of such research for most European countries, as the grapheme-phoneme consistency in English orthography is low. Contrastive research (Aro & Wimmer, 2003; Defior, Martos, & Cari, 2002; Goswami, Gombert, & de Barrera, 1998) has shown that the acquisition and execution of word recognition skills is much more demanding for an orthography with exceptionally low grapheme-phoneme consistency than for more consistent orthographies. Due to the predictability of grapheme-phoneme correspondences, children learning to read in a shallow orthography can acquire decoding skills easily and with less repeated encounters with the word than in a deep orthography such as English. It can be assumed that the frequency of encounters necessary to access the meaning of that word will not be sufficient enough and that students could be able to retrieve the phonological pronunciation without semantic access. Therefore, testing meaning activation is particularly important in phonologically shallow orthographies, such as Spanish, especially for L2 students, because decoding competence, that is the retrieval of the phonological form, may not necessarily imply meaning activation. In the case of Spanish, there is no single study that focuses on the factors that could facilitate how to learn to read in Spanish as a second language.

The second goal of this study is to clarify the role of oral language proficiency in predicting word recognition. It can be assumed that most children learning to read in a second language have to face a dual task: besides learning the unique characteristics of the written language, they will have to master the oral form of that language. Educators give preference to the achievement of oral skills, and as a consequence, children taught to read under this approach are denied exposure to the new L2 orthography and begin to be left behind by their monolingual peers (Durgunoglu, 1998). However, L2 reading researchers (Durgunoglu, Nagy, & Hacin-Batt, 1993; Geva & Siegel, 2000) have a different point of view on the issue, and the present research indicates that L2 oral proficiency plays only a limited role in accurate L2 word recognition skills and that other essential reading facilitators such as letter knowledge and phonological awareness seem to play a more relevant role. Yet when testing word recognition, most of these studies used the same measure as for testing L1 word recognition, which only measures phonological information extraction and does not consider whether students know the meaning of a given word.

In summary, it is proposed that in reading Spanish as a second language, word-meaning identification is one of the important theoretical constructs to be taken into account. In their use of the same word recognition test, that of L1, L2 researchers are not testing to determine whether students know the meaning. This researcher therefore hypothesizes that by measuring word-meaning identification, the role of oral language proficiency may change and could have a more predictive role for literacy learning in Spanish as a second language than previously claimed.

Leikin, Share and Schwartz (2005) distinguished between two groups of bilinguals: bi-literate bilinguals and mono-literate bilinguals. Bi-literate bilinguals learn to read in a second language after or in parallel with L1 reading acquisition. L1 literacy development can facilitate L2 reading development among bi-literate bilinguals, especially in the development of metalinguistic skills such as phonological awareness (Durgunoglu, 1998). By contrast, mono-literate bilinguals are bilingual in the spoken language but learn to read only in their second language. Therefore, their reading attainment could be inferior to that of bi-literate bilinguals (Schwartz, Leikin, & Share, 2005). Mono-literate bilingualism is increasingly common in Third World countries and among children of immigrants, who must adapt to the orthography used in school. McBride-Chang (2004) estimated that approximately 50 percent of all children in the world learn to read for the first time in a second language.

The focus in the present study is on Moroccan second-graders who are in a submersion context and are learning to read in Spanish as a second language for the first time. For this group of children and in this particular context, it is critical to examine the development and interactions of cognitive and linguistic skills that are predictors of reading development. Given that literacy development during the early elementary school years has an ever-widening impact on academic achievement in later years, it needs to be a clear focus of attention in the education of children who have a home language other than the language of instruction

1.1 LINGUISTIC DESCRIPTION

In order to determine the required processing competencies for the development of early literacy skills, relevant linguistic features of the languages involved need to be clearly identified. This section is devoted to describing the features of Spanish orthography, phonology, and morphology that may have an effect on learning to read. Then, a revision of the main difficulties for Moroccan Arabic and Berber speakers will be analyzed.

1.1.1 Grapheme-phoneme correspondence in Spanish

Spanish is a Roman-alphabetic language, considered to have a shallow or transparent orthography with a regular and consistent mapping between Spanish graphemes and phonemes (Cuetos & Labos, 2001; Jiménez & Ortiz, 2001). The reason for such simplicity is historical: during the eighteenth century, the orthography was modified and a phonological criterion was adopted that gave precedence to pronunciation over etymology (Signorini, 1997).

Let us first consider mapping from print to sound. The Spanish alphabet consists of 30 graphemes, 27 letters, and 3 consonant digraphs ({ch}, {ll} and {rr}). Of the 27 letters comprising the Spanish alphabet, 21 have a one-to-one correspondence between a single letter and a phoneme (*a, b, d, e, f, i, j, k, l, m, n, ñ, o, p, q, s, t, u, v, w, z*). Of the remaining consonants, *h* is silent, and five (*c, g, y, x, r*) are regular within the context of the syllabic structure in which they appear: the letter *c* is pronounced as the velar /k/ when it is followed by the vowels /a, o, u/, and /θ/ when followed by the vowels e and i. The letter *g* has a velar pronunciation /g/ when followed by the vowels a, o, and u and /x/ in front of i and e. The letter *r* is pronounced as /r/ in any position except after a pause, nasal or lateral. The grapheme *x* is read /s/ when located at the beginning of the word, but is read /ks/ in the remainder of cases: *léxico* [léksiko] ('lexicon').

Mapping from phonology to orthography is not as regular as the Spanish grapheme-phoneme correspondence used in reading. There are a few cases where a single phoneme maps to two or more graphemes (the phoneme /b/ maps to *b* or *v*, and the phoneme /k/ maps to *c* or *q*).

1.1.2 Syllables in Spanish

Syllables in Spanish are well defined, and the syllable boundaries are always clear (Harris, 1983). Ambisyllabicity, the fact that a given letter or phoneme can be considered as belonging either to one syllable or an adjacent one, occurs in only two Spanish words: “atleta” and “atlántico,” where the “t” could be allocated to the first (at-) or to the second syllable (tle-, or tlán). The number of syllable structures is reduced, in Spanish: there are only 19 different structures, and the most common ones (CV and CVC) account for 70% of the syllables in written Spanish (Domínguez, de Vega, & Cuetos, 1997).

In the Spanish language, syllables are easier to detect than in English, possibly because the syllable is the basic unit of articulation (de Manrique & Signorini, 1994). With regard to the Spanish syllable, Harris (1983) noted that it has two constituents: the onset and the rime. The onset is optional to the syllable in Spanish and can be constituted by any consonant segment of the language (e.g., /s/ in sol). The rime is the obligatory constituent containing the sonority peak, which is always a vowel in Spanish but not necessarily in other languages.

Spanish is a free-stress language and is lexical; two words can differ in meaning through a simple change in stress. The normative pattern of accentuation in Spanish is on any of the three final syllables (Quilis, 1981). The stress most commonly falls on the penultimate syllable, which accounts for 79.5% of all words, while 17.68% are stressed on the medium syllable and 2.76% are stressed on the last syllable. Stress can be predicted from the orthography, with an accent mark on the stress vowel. The accent mark also serves to differentiate between identically spelled words with different meanings. Thus the word *titulo* expresses a verb, the first-person indicative of the verb *titular* [to title] and means "I title." The word *título*, on the other hand, expresses the corresponding noun [a title], and *tituló* is the third-person-singular form of the past tense of the same verb *titular*. The accent in Spanish expresses differences that clearly affect the morphological analysis of lexical entries (Sainz, 2006).

Because of this stress pattern, the syllable is a perceptually salient unit in the segmentation of the spoken language (Durgunoglu et al., 1993).

1.1.3 Spanish Morphology

The orthography of the Spanish language reflects a simpler phonology but a more complex morphology. The foundation of Spanish morphology rests on Latin, Greek, and Arabic.

Spanish is a Romance language, and, as such, it is an inflectional language in which the words generally have a lexical component combined with a grammatical one. Comrie (1981) offered a useful mode for discussion of morphology in the world's languages by introducing the concept of two morphological dimensions: one dimension concerns the number of morphemes per word, and the other dimension concerns the extent to which the morphemes within a word can be segmented or separated from each other. He classified Spanish as a *fusional* language, as the morphemes cannot be split into components of meaning (e.g., the ending of the Spanish verb encodes person, number, and tense, with the grammatical meaning all rolled up into one morpheme). For example, -o in *canto* [I sign] encodes the grammatical meanings: first person singular present tense. It is not possible to know which part of the -o means first person singular, all meanings are joined together into one form and can not be separated. Other than interjections, conjunctions, prepositions, and a subset of adverbs, there are no more words in Spanish immune to both inflection and derivation (Green, 1990); rather, morpho-syntactic markers are usually affixed to the lexical root for derivation and/or inflection, and stem changes are uncommon.

Nouns and adjectives are generally marked for gender (masculine and feminine) and for number (singular and plural). The Spanish system for marking nouns and adjectives is different from the system which marks verbs, a three-way (-ar, -er, -ir) series of conjugations in different tenses, persons, and numbers.

Nouns are often clearly marked as to their function in the sentence, and verbs are clearly marked with their inflection of person, number, and tense. For students of L2 Spanish, the clarity of such marking causes certainty in attributing a part of speech to a word, and therefore phrasal structure is easy to compute (Birch, 2002).

1.1.4 Methods of learning to read

At present in Spain, literacy instruction is provided in the last year of kindergarten, at the age of five years. Most children need less than two more years to properly master decoding in Spanish. At the average age of seven years, most children are able to correctly enunciate a word of any orthographic complexity provided that no learning impediment exists (Sainz, 2006).

The methods used to teach literacy vary greatly, and most teachers used mixed methods comprising aspects of global methods (whole word and sentence) and phonemic methods (stressing the relationship between graphemes and phonemes).

Because of the saliency, regularity, and predictability of the Spanish syllables, they are important units in Spanish reading, and reading instruction is often based on the recognition and spelling of syllable units as opposed to single phonemes (Denton, Hasbrouck, Weaver, & Riccio, 2000; Freeman & Freeman, 1997).

1.1.5 The language situation in Morocco

Contemporary Morocco can be characterized as a multilingual society in which three language systems coexist: Arabic (in at least two varieties), Berber (in several varieties) and French. French is rarely heard in rural areas, whereas Arabic and/or Berber predominate in those areas, depending on the region (Wagner, 1998).

The earliest known inhabitants in what is now Morocco were the Berbers. Until relatively recently, they were a nomadic people who also engaged in agriculture. The Berber language is a member of the Hamitic family of languages (which includes Ethiopian), whereas Arabic is a Semitic language. Berber bears virtually no semantic or syntactic similarity to Arabic (Wagner, 1998). Berber is spoken in three dialectal forms (tamazight, tashelhit, and rifi); these forms are usually associated with particular regions of Morocco. It appears that the major concentration of Berber monolinguals — predominantly women and young children — are located in the mountain and desert regions, and especially in the north. Berber is considered to be an unwritten language; therefore Berber dialects have used Standard Arabic or French (Roman) scripts.

Morocco has the lowest adult literacy rate in North Africa. The lag between literacy rates for men and women is still considerable. In 2004, for adults, the literacy rate was 65.7% for men, as compared to 39.6% for women (World Bank, 2004).

Wagner et al. (1989) compared the reading development rates of Moroccan Arabic children and Berber monolinguals learning to read Standard Arabic. Results from the 1st year of the study showed that Arabic-speaking children outperformed Berber-speaking children. However, the difference between language groups diminished with time and no significant effect was found in years 3 and 5. There appears to be some advantage to speaking dialectal Arabic as a mother tongue when first beginning to read, but these differences diminish substantially over subsequent years of schooling in Morocco.

1.1.6 Differences between Spanish and Moroccan Arabic that could interfere when learning to read

The Moroccan Arabic and Berber vocalic repertoires include all the vowels that the Spanish language has: -a, -e, -i, -o, -u. Thus, Moroccan children have no difficulty pronouncing the Spanish vowels (El-Madkouri Maataoui, 2003). However, in Moroccan Arabic and in Berber, there is no phonological opposition between –u/-o and –e/-i, as there is in Spanish. Thus, Moroccan students sometimes have difficulty discriminating between u/o and e/i, as for them there is no difference in meaning; e.g., they produce *peru (Peru)* for *pero* (but) or *peso* (weight) instead of *piso* (flat).

Another difference is that there are no diphthongs in Moroccan Arabic, so when they try to read a word with a diphthong, they tend to segment the word differently. As for common errors, Gari (2001) stated that they generally assimilate dipthongs to one vowel, so they may say *Marrucos* instead of *Marruecos* (Morocco), and *bin* for *bien* (good).

The voiceless bilabial stop /p/, does not exist in Classical Arabic, as a result, an Arabic speaker learning Spanish may oftentimes fail to identify the phoneme and may tend to voice the consonant, pronouncing *beso* (kiss) for *peso* (weight), and *roba* (he/she steals) for *ropa* (clothes). However, this phoneme exists in Berber and also forms part of the Moroccan Arabic phonological inventory, thanks to the high number of loan words from French and Spanish (Heath, 1989), so Berber and Moroccan Arabic speakers will have little difficulty discriminating and pronouncing this consonant.

There are many orthographic differences between Spanish and Modern Standard Arabic, such as different script, different direction, and a lack of distinction between uppercase letters and lowercase letters. Despite these differences, Moroccan children are not exposed to Modern Standard Arabic and Arabic literacy before formal schooling in first grade (Wagner, 1998). Because our participants have not attended school in Morocco, orthographic differences are unlikely to be relevant. At the same time, the texts for beginning readers in Spanish (Grades 1 or 2) rarely include specific and complicated morphological constructions that may cause difficulties to foreign children who know Spanish on only a basic level.

In summary, a revision of the main phonological differences between Moroccan Arabic and Spanish has shown that Moroccan children are able to draw upon their L1 phonological system in order to pronounce most of the Spanish graphemes. Phonological and orthographic differences between the two languages are unlikely to be critical for their reading development.

2.0 REVIEW OF THE RELATED LITERATURE

I start this literature review by focusing on the importance of word recognition, and analyzing the role of basic prerequisites in the development of word-recognition skills. I then revise how the transparency of the orthography may influence the way in which word recognition is acquired, in both the L1 and the L2. Next, I focus on the influence of oral language proficiency in English in word recognition development in L1, and in transparent orthographies and in L2. The literature review ends with a review of how decoding accuracy and oral language skills facilitate reading comprehension in the L1 and the L2.

2.1 THE PROCESSES INVOLVED IN WORD RECOGNITION

Many researchers have claimed that word decoding and word recognition are the skills central to reading proficiency (Juel, Griffith, & Gough, 1986; Just & Carpenter, 1987). It requires the combining and “unitizing” of knowledge about the word’s meaning, its phonology, and its orthography (Bowers & Wolf, 1993). Consequently, it is important to be clear about the fact that word recognition involves three related, but distinct constituents: phonology, orthography, and semantics. Contextual facilitation is assumed to occur after the word’s semantic information has been accessed (Stanovich, 1986; Perfetti, 1985).

Although the terms "word recognition" and "decoding" are often used interchangeably in the literature, in this review "word recognition" refers to the processes of obtaining a word's sounds and meaning, and "decoding" deals specifically with the extraction of phonological information.

An attempt to explain how readers achieve meaning from print led to the development of the dual-route theory of reading (Coltheart, 1978). This theory holds two possible paths for gaining access to meaning of print: the phonological route and the lexical route. Following the phonological route (indirect access), the word is turned letter-by-letter into the spoken form. It involves understanding and applying the basic mechanism of grapheme-phoneme correspondences. This path is considered non-lexical because whether the letter string is a real word or a nonsense word is not important. On the lexical route (direct access) the string of letters is recognized as a whole and then looked up in a mental lexicon in order to retrieve the meaning and, later, the pronunciation. Access to phonology is mediated by access to the semantic knowledge resource. Cook and Bassetti (2005) noted that,

> The dual route model demonstrates how it is possible in sound-based writing systems to read words without knowing what they mean. An Italian place name such as "Marche" can be read aloud by an English speaker news-reader as /mɑːkə/ at least recognizably to other English speakers, even if have never seen it or heard it before. (p. 15)

In recent years, the dual-process framework has been challenged on several grounds (Adams, 1990; Seidenberg & McClelland, 1989). For example, the lexical route is not well specified as being either logographic or consisting of sub-units. Further, the notion of completely independent routes appears improbable.

Connectionist models of reading explain the ability to read both English familiar and unfamiliar words as a result of accumulated experience. According to connectionist models, knowledge is represented in terms of weights on connections between units (Seidenberg, 1992). In other words, the ability to read irregular words correctly is not due to the use of grapheme-phoneme correspondence (GPC) rules but to "weights on connections between units in a lexical network that produce the correct input (orthographic) - output (phonological) mappings" (Seidenberg, 1992, p.132). For example, the pronunciation of the spelling pattern –ave depends upon the consonant in front of it. If the word starts with s-, the pronunciation of –ave is [*eiv*], but if the word starts with h-, the pronunciation changes to [æv]. In sum, there is a net that maps from orthography to phonology, producing correct output for all words whether they are regular or irregular.

The most influential connectionist model of word recognition is the Triangle model (Harm & Seidenberg, 1999; Plaut, McClelland, Seidenberg, & Patterson, 1996). It shows the interaction of orthographic, phonological, and semantic factors by proposing the existence of two pathways: a phonological pathway that maps orthography to phonology and a semantic pathway that links phonological, semantic, and orthographic units of representation. The phonological pathway is crucial for learning to decode, whereas the semantic pathway is crucial for proficient word recognition and comprehension. An assumption of the model is that, at the beginning of reading development, the cognitive resources are devoted to establishing the mapping between letters and sounds, whereas the later stages of development are characterized by reliance on the semantic pathway to gain fluency in reading.

As we can see, several specific models of word recognition have been proposed, but for the purposes of the present study, they are equivalent in that they all proposed that orthographic, phonological, and semantic representations are needed to achieve proficiency at word recognition.

2.2 PREREQUISITES OF WORD RECOGNITION

While it is acknowledged that multiple factors contribute to the development of word recognition, it is important to discern the most promising combination of prerequisites of early reading achievement. Most developmental researchers would agree that the establishment of the phonological representation in alphabetic writing systems depends on the child acquiring the alphabetic principle, the idea that the letters that comprise our written language represent the sounds that comprise our spoken language (Byrne & Fielding-Barnsley, 1989; Treiman, 2000). Children need at least two skills in order to achieve the alphabetic principle: phonological awareness, and knowledge of letters (Adams, 1990).

Apart from the alphabetic principle, the development of word-based processes in alphabetic languages has also been shaped by basic requirements such as awareness of print and accuracy of lexical access (Gholamain & Geva, 1999; Geva & Siegel, 2000). Children with deficiencies in these areas are likely to develop reading problems regardless of the orthography and whether they are learning to read in the L1 or in the L2 (Durgunoglu & Oney, 1999). A description of these skills will follow.

2.2.1 Phonological awareness

This ability refers to sensitivity to the sound structure of language (Treiman, 2000). Before a child can understand how orthography represents spoken language, the child needs to be aware of the relevant units of the spoken language. Phonological awareness is not a single homogeneous skill; this insight includes ability to identify and manipulate phonological units such as words, syllables, onset-rimes, and phonemes (Liberman, Shankweiler, Fischer, & Carter, 1974). Researchers agree on a sequence of phonological development: an awareness of syllables, onsets, and rimes typically develops before an awareness of phonemes (Goswami & Bryant, 1992; Treiman, 1991).

A consensus exists regarding the importance of phonological awareness in learning to read, children with PA skills have well-specified representations that provide the foundation for a set of mappings between phonological and orthographic representation (Hulme et al., 2002). However, debate surrounds its specific contributions to word reading. Although the connection is almost certainly bi-directional (Perfetti, Beck, Bell, & Hughes, 1987; Stahl & Murray, 1994), the specific nature of the pathway between phonological awareness and reading remains in dispute. Some researchers describe the PA skills of rhyme and analogy as a “powerful determinant of the speed and learning efficiency of learning to read” (Goswami & Bryant, 1992). Others deem phonemic awareness essential to reading acquisition (Nation & Hulme, 1997), while still others believe that it is reading development that causes phonological awareness, as opposed to the other way around (Morais, Cary, Alegría, & Bertelson, 1979).

There is evidence that L1 Spanish-speaking students acquire PA skills in a developmental order similar to the one observed in English speakers with sensitivity to syllables being followed by sensitivity to individual phonemes (Carrillo, 1994; Cisero & Royer, 1995; Durgunoglu et al., 1993). However, it is still unclear whether or not syllabic awareness is a precondition of learning to read in the Spanish language. Whereas some studies found that syllabic awareness is a better predictor of future reading ability (Carrillo, 1994) and that syllable awareness predicts phonemic awareness (Ferreiro & Teberosky, 1982), others found that a greater mastery of the alphabetic code was associated with higher levels of intrasyllabic and phonemic awareness and that syllabic awareness was not strongly related to reading skills (Jiménez & Ortiz, 1994; 2001).

2.2.2 Letter knowledge

Letter knowledge includes knowledge of letter names, knowledge of letter sounds, and the ability to retrieve this information quickly and effortlessly (Treiman, 2000).

Letter identification has been identified as one of the best predictive measures in reading development (Chall, 1989; Ehri & Sweet; 1991). Scarborough (1998) analyzed 61 prediction studies of young readers in English. A repeated finding was that once a child had begun formal literacy training, the best predictor of future reading was the child's current level of skill with printed letters. For preliterate children, a measure of letter knowledge accounted for an average of 35 percent of the variance.

Pre-readers' knowledge of the names and sounds associated with letters of the alphabet has been shown to be associated with phonological awareness and subsequent reading ability. Phonological awareness, particularly at the level of phoneme, is thought to be influenced by the child's letter knowledge (Ehri, 1998; Goswami & Bryant, 1992; Morais, et al., 1979).

2.2.3 Awareness of print

Awareness of print refers to the child's knowledge about the forms and functions and conventions of print (Durgunoglu & Oney, 2000). This includes an understanding that print carries a message, and conventions such as the left-to right and top-to-down direction of print, the difference between print and pictures, where to begin reading a sentence, and meaning of the elements of punctuation (Adams, 1990; Whitehurst & Lonigan, 1998).

Research has shown that knowledge about the functions of print assists in the reading process, particularly in the earliest stages (Clay, 1979; Turner, Harriman, & Nesdale, 1988). These concepts are fundamental for children in order to be readers (Dickinson & Snow, 1986; Ehri & Sweet, 1991).

2.2.4 Syntactic awareness

Syntactic awareness can be confused easily with syntactic knowledge. Oakhill and Cain (2004) provided a clear distinction between those concepts:

> Syntactic knowledge is required to extract meaning from different syntactic constructions, e.g. the sort of knowledge that is required to appreciate the meaning of active vs. passive constructions. Such knowledge may be implicit. By contrast, syntactic (or grammatical) awareness is regarded as explicit knowledge involving deliberate and controlled reflection on the language. Syntactic awareness is not necessarily required to extract meaning but would, for example, be used in decisions about grammatical well-formedness. (p. 161)

Syntactic awareness appears to be critical for fluent and efficient L2 text reading comprehension, which requires making predictions about words that come next in a sentence (Low & Siegel, 2005). However, findings are mixed on the extent to which differences in L2 syntactic awareness relate to L2 reading development.

In the first years of learning to read, English as a Second Language (ESL) , compared with native English-speaking children, have shown similar word decoding performance despite lower syntactic awareness skills (Chiappe & Siegel, 1999; Chiappe, Siegel, & Gottardo, 2002; Lesaux & Siegel, 2003). However, in the middle-school years, the results are mixed. Da-Fontoura and Siegel (1995) found lower syntactic awareness for the ESLs learners, but native Arabic ESLs learners did not differ in syntactic awareness (Abu-Rabia & Siegel, 2003), and Italian ESLs students had significantly higher syntactic awareness scores than their native peers (D'Angiulli, Siegel, & Serra, 2001).

Findings are also inconclusive about the role of syntactic awareness predicting word-reading skills among ESLs. Some studies have reported that syntactic awareness can predict variance both in L2 reading decoding and L2 reading comprehension skills (Chiappe, Siegel & Wade-Woolley, 2002; Low & Siegel, 2005), while in other studies syntactic awareness did not predict decoding performance in the first grade (Gotardo, 2002; Lesaux & Siegel, 2003).

In all these studies, syntactic awareness was measured by an oral close task where students fill in the missing word in a sentence. Semantic knowledge may influence performance on this task, as Oakhill and Cain (2004, p.161) posited when they observed that "the correct filler must be selected on the basis of the word's meaning and its pragmatic function". Thus, the border line between what can be considered as syntactic awareness and what cannot is still not clear. On the other hand, oral language proficiency has been assessed with tasks that could be considered syntactic awareness, like sentence completion (Durgunoglu et al., 1993).

2.2.5 The mental lexicon

L1 reading theories suggest that each word has a representation in a "mental lexicon," our storage of all the information—phonological, morphological, semantic, and syntactic—that speakers know about individual words (Levelt, 1989).

Using both orthographic and phonological representations, the mental dictionary is quickly searched for an entry that most closely matches the input with respect to its pronunciation and/or spelling. When a satisfactory match is found, the printed word has been recognized (Snow, Burns, & Griffin, 1998). At this point, the reader can now retrieve all the other information that has been stored about the word, including its meaning and syntactic constraints.

This memory store predates the onset of reading instruction and essentially parallels his or her speech lexicon in the L1 (Oney, Peter, & Katz, 1997). According to Stanovich (1993) in L1, there is no research evidence indicating that decoding of a known word takes place without meaning extraction, on the contrary, decoding automatically leads to meaning activation, when the meaning of the word is adequately established in memory.

Beginning children start reading words by processing letter–sound relationships in a serial manner (Ehri, 1995). This strategy of word recognition is described in such terms as cipher reading, phonological recoding, word attack, grapheme–phoneme conversion, or simply decoding (Aaron, Joshi, Ellsberry, Henderson, & Lindsey, 1999). In contrast, skilled readers do not carry out a letter-by-letter decoding procedure but are believed to accomplish word recognition automatically, as single word units, without pauses between word parts (LaBerge & Samuels, 1974; Ehri, 2005). This form of word recognition is referred to as "sight-word reading" (Ehri, 1992). The term "sight" indicates that, as soon as sight is trained on a word, the meaning and pronunciation are retrieved from the mental lexicon quickly and automatically. It is clear that being able to read words automatically from memory is the most efficient, unobtrusive way to read words in text.

Thus, the development of a mental lexicon becomes essential when learning to read, as this is where connections for sight-word reading are stored. According to Ehri and Snowling (2004, p. 437), "These connections secure the sight word in memory with the spelling, pronunciation, and meaning bonded together as a unit".

2.3 DIFFERENCES ON THE DEVELOPMENT OF L1 WORD RECOGNITION IN SHALLOW ORTHOGRAPHIES

Some orthographies, including German, Spanish, Dutch, Italian, Serbo-Croatian, are said to be "shallow" or "transparent" in that graphemes in these systems generally represent only one phoneme. The mappings from letters to sounds are consistent, and there are very few irregular words. However, other alphabetic systems, including English and French, are said to be "deep" or "opaque". This means that individual graphemes represent a number of different phonemes in different words, and there many exceptions to grapheme-phoneme correspondence rules. On the other hand, the English writing system allows the reader to have direct access to the morphology of the language (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001).

Many authors have suggested that differences in the depths of alphabetic codes imply different ways of processing written languages (Baluch & Besner, 1991; Seidenberg, 1985). The Orthographic Depth Hypothesis (ODH) states that in shallow orthographies, where there is a regular phoneme-grapheme correspondence, a phonological representation is assembled prior to lexical access. In deep orthographies, phonological processes depend more on lexical information (Katz & Frost, 1992).

It seems likely that these language differences in orthographic transparency have a determining effect on word decoding, especially on the rate of reading acquisition, the development of phonological awareness, and stages of learning to read. However, a transparent orthography does not confer any advantage as far as reading comprehension is concerned (Hanley, Masterson, Spencer, & Evans, 2004). Each of these differences will be considered in turn.

2.3.1 Differences on the rate of reading acquisition

Cross-linguistic studies between these orthographies have determined that phonological processing, that is, the ability to translate printed words into their spoken equivalents, underlies successful reading acquisition in all orthographies (Frith, Wimmer, & Landerl, 1998; Goswami et al., 1998). The difference is clearly in the rapid development of word-decoding skills (Wimmer & Goswami, 1994; Goswami et al., 1998; Aro & Wimmer, 2003). A small-scale study of initial reading development in 13 European orthographies (Seymour, Aro, & Erskine, 2003) indicated that children learning to read in transparent orthographies were close to ceiling in both word and nonword reading tasks by the middle of first grade. English-speaking children were poorer in accuracy even after two years of instruction. Analogous results were observed when reading acquisition of English was compared to reading acquisition of a more regular orthography. Studies of children learning to read in transparent orthographies such as Turkish (Oney & Durgunoglu, 1997), German (Wimmer & Hummer, 1990, Frith et al., 1998), Welsh (Ellis & Hooper, 2001; Spencer & Hanley, 2003), and Italian (Cossu, Shankweiler, Katz, & Tola, 1998; Thorstad, 1991) have shown that reading skill develops very rapidly at school; the biggest advantage of a regular orthography is during the first year of instruction. By the sixth year of formal instruction, decoding accuracy of children learning to read in a shallow orthography had caught up with those learning to read in transparent orthography (Ellis & Hooper, 2001).

If the orthography is highly transparent, then grapheme-phoneme correspondences should be easy to detect and use. However, when learning to read in English, knowledge of the regular grapheme-phoneme correspondence is not sufficient. Knowledge of the high-level constraints of morphology and etymology are necessary.

2.3.2 The development of phonological awareness

Shallow orthographies with mostly regular words may be better sources for the development of phonological awareness than deep orthographies. The reason is that individuals have very direct insight into the phoneme structure of the spoken word. The precise phoneme structure is directly visible in the written word (Goswami, 2006).

Several studies have reported that syllable and phoneme awareness can develop more rapidly amongst children learning to read in a transparent orthography (Cossu et al., 1988; Oney & Durgunoglu, 1997; Durgunoglu & Oney, 1999; Mann & Wimmer, 2002; Spencer & Hanley, 2003).

Cross-linguistic research has demonstrated that the same sequence of phonological awareness development can be observed in children depending on the orthography. The developmental sequence of syllabic and onset/rime awareness preceding awareness of phonemes is consistent (Cossu et al., 1988; Goswami et al., 1998).

Another question is whether awareness of the same phonological units predicts reading development. The focus here is primarily on the role of onset and rime awareness. A number of studies carried out in English have demonstrated that early rime awareness is an important predictor of later progress in reading (Bradley & Bryant, 1983). However, a functional relationship between onset-rime awareness and reading development has not been found in studies in other orthographies (Wimmer, Landerl, & Schneider, 1994). It seems that exposure to languages that are phonologically transparent promotes phonemic and syllable awareness as phonemes and syllables are more salient, and exposure to languages in which the sound-symbol regularity lies at the onset-rime levels promotes the development of onset-rime awareness.

As the acquisition of phonological coding poses less of a problem in regular orthographies, the contribution of phonological awareness to reading skill is limited to the very early stages of reading acquisition and disappears after first grade (Cossu et al., 1988; Oney & Durgunoglu, 1997; Frith et al., 1998; de Jong & Van der Leigh, 2002). In English, individual differences in phonological awareness remain to be an additional influence on reading comprehension.

2.3.3 The Psycholinguistic Grain Size Theory

In order to provide a theoretical framework for the differences in the ease with which reading acquisition is accomplished in different orthographies, Goswami, Ziegler, and colleagues developed the Psycholinguistic Grain Size Theory (PGST) (Goswami, Ziegler, Dalton, & Schneider, 2003; Ziegler & Goswami, 2005, 2006). According to Goswami, "the sequence of phonological development may be language universal, the ways in which sounds are mapped to letters (or other orthographic symbols) are language specific" (Goswami, 2006, p. 28). The fundamental assumption guiding PGST is that it is critical that the child finds the most effective grain sizes in a given orthography for achieving reading fluency. The grain sizes, defined as the orthographic information necessary for phonological decoding, vary depending on the consistency of the language and on the syllable structure. Reading in languages like Italian or Spanish, which have a consistent orthography and simple syllable structure, involves learning grain sizes at the phoneme level, because grapheme-phoneme correspondences are consistent. Reading in a language such as German, which has a orthographic consistency but a complex syllable structure, would imply a slower acquisition. Reading in inconsistent orthographies involves learning larger units, such as syllables, rimes, and whole words.

Frost (2006) observed that the PGST seems to present an improved model of the Orthographic Depth Hypothesis as it examines a continuous measure, rather than the dichotomous concept of "lexical" or "prelexical" (Frost, 2006, p. 43). Following this theory, the dual route model of reading words is also challenged. There is a belief that, if both routes do exist, this may be the case only for English (Goswami, 2006).

2.3.4 Reading accuracy vs. reading fluency

For children learning to read in a shallow orthography, speed is the most important aspect of word decoding when predicting reading comprehension (Wimmer & Goswami, 1994). Research on Dutch (de Jong and van der Leigh, 2002) and German children (Wimmer et al., 1994) suggests that rapid naming may play a more prominent role than reading accuracy in explaining and predicting individual differences in reading development.

2.3.5 Different phases of reading development

Many developmental theories of word recognition focus on the role of phonology rather than meaning. In fact, the mechanisms behind decoding are thought to be phonologically based (Ehri, 1992). Utah Frith (1985) and Linnea Ehri (1992) both offer L1 models of English reading development (see Table 2.3.1).

Table 2.3.1: Two Models of Reading Development (adapted from Bielby, 1999).

Frith (1985)	Ehri (1995, 2002)
Logographic stage	Pre-alphabetic phase Partial alphabetic phase
Alphabetic stage	Fully alphabetic phase
Orthographic stage	Consolidated alphabetic phase

In Ehri's phase theory, children progress though four phases: pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic. In the pre-alphabetic phase children read some words by remembering some visual features but they do not form letter-sound connections to form a word. Children progress to the partial alphabetic phase, where they start forming connections between some letters and sounds in a word, often the first and the final. Children at this phase still do not know how to read pseudowords and words they have not seen before. This leads to the third phase, where children become fully alphabetic by forming complete connections between letters and phonemes. At this phase, readers are able to represent unfamiliar words, to invent spellings, and to remember correct spellings of words. The consolidated phase emerges when children become familiar with chunks and rimes, syllables, morphemes, and whole words.

Research has claimed that these sequences may not apply to learning to read a highly transparent orthography. Readers in a transparent orthography may not pass through initial stages of logographic access and partial-alphabetic reading; they might start directly in the alphabetic phase (Wimmer & Hummer, 1990). Even Ehri (2005) admits that the partial alphabetic phase might not be relevant in transparent languages when phonics-method is employed. This claim is based on the study of Cardoso-Martins (2001), who compared Portuguese kindergarteners who received instruction in phonics with those who received whole-word instruction. When the beginning readers were taught with a phonics method, no evidence of partial-phase reading was observed but the whole-word group did exhibit the partial phase in their reading and spelling.

One major difference between the Frith model and the Ehri model (1992, 1995, 2005) is the role of phonology in the final stage of word recognition. Whereas Frith (1985) considers the orthographic skills stage as “non-phonological”, Ehri considers it as a phase where grapheme-phoneme correspondence and orthographic knowledge are used, even though she distinguishes between decoding and retrieving words from memory. This final orthographic stage might not be necessary in transparent orthographies. It is possible that, because transparent orthographies have great consistency, readers can decode efficiently at the fully alphabetic stage. There is no need for them to develop further strategies, as English readers do (Birch, 2002).

2.4 THE DEVELOPMENT OF L2 WORD RECOGNITION

Although a great deal is known about the cognitive processes that are assumed to be significant in the development of reading skills in English as L1, the question remains as to whether the same patterns exist for children learning in other orthographies and in a second language. Research has demonstrated that the same components and processes are involved in reading acquisition for native and for non-native speakers.

In a review of research examining factors that determine children's ability to acquire literacy in a second language, the issue of L1 transfer is crucial. A difference should be made between studies of L1 non-literate children, studies of children learning to read concurrently in two languages, and studies of L1 literate children.

2.4.1 Studies of L1 non-literate individuals

L1 non-literate children may have significant gaps in their educational backgrounds and often need additional time to become accustomed to school routines and expectations, but it seems that in time, they have the capacity to acquire the same degree of accuracy with regard to word decoding skills.

Studies concerning non-literate children learning to read in a L2 transparent orthography have been carried out by Verhoeven (2000), Verhoeven and Vermeer (2006), and Droop and Verhoeven (1998, 2003) which focus on immigrant Turkish and Moroccan children who are learning to read in Dutch. After two years of formal reading instruction, the L2 decoding by the minority children was just as accurate as that of their native-Dutch speaking peers.

Wagner et al. (1989) compared the reading development of Berber and Arabic speakers learning to read in Arabic. Arabic-speaking children performed significantly better than Berber-speaking children on the year one reading measures. However, Berber monolingual children essentially caught up to their Arabic-speaking peers by the fifth year of primary school.

Schwartz et al. (2005) compared bi-literate and mono-literate Russian first-graders learning to read in L2 Hebrew with monolingual Hebrew children. The mono-literate first-graders did not know how to read in the L1. The data showed that bi-literate bilinguals were far superior to both mono-literate bilinguals and monolinguals in all measures of L2 phonological awareness, and on the reading rate measures (words, pseudowords, and text). These findings demonstrate that PA transfer can take place even with different scripts. Bi-literate bilinguals were also superior to mono-literate bilinguals in Russian phonological awareness tasks, confirming the reciprocal relationship between literacy learning and phonological awareness. However, bi-literates' advantage did not extend to other spoken language abilities (syntax and semantics). The authors claimed that these findings serve to support the view that it is bi-literacy, and not bilingualism, which contributes to reading development, and that bilingualism *per se* might not be the most important factor in the development of phonological awareness skills (Bialystok, 2002).

2.4.2 Studies of children learning to read concurrently in two languages

Performance of English as a Second Language learners who were native speakers of Portuguese (Da Fontoura & Siegel, 1995), Italian (D'Angiulli, et al., 2001), and Arabic (Abu-Rabia & Siegel, 2002) was compared to their respective native English-speaking peers. In all those studies, children learning to read in English manifested word reading accuracy comparable to that of L1 students.

Similarly, in three separate studies focusing on L1 English children learning to read in Hebrew, it was found that the accuracy rate was higher in the L2 (Geva & Siegel, 2000; Geva et al., 1993; Gholamain & Geva, 1999). Incidence of errors in reading vowels was significantly higher in English than in Hebrew.

2.4.3 Studies of L1-literate individuals

When the L1 literate individual is learning to read in a L2 transparent orthography, the writing system can facilitate the rate of reading development and the development of phonological awareness (Chitiri, Sun, & Willows, 1992). However, when the L1 literate in a shallow orthography is learning how to read in a L2 deep orthography, the transfer of strategies can facilitate or interfere the activation of the decoding skills. The transfer may facilitate the development of phonological awareness and phonological processing, but children need to have more experience with L2 print processing to be able to pronounce irregular words (Mumtaz and Humphreys, 2001). They also need to learn to read by consolidated chunks of words because the orthographies of their languages may not have required development of that strategy (Birch, 2002).

2.5 THE INFLUENCE OF ORAL LANGUAGE PROFICIENCY

2.5.1 The influence of oral language proficiency in L1 word recognition

Oral language proficiency (OLP) is one of the skills under investigation in the literature as a potential contributor to basic reading skills (Catts, Fey, Zhang, & Tomblin, 2001; Dickinson & Snow, 1987; Lonigan, Burguess, & Anthony, 2000; NICHD, 2005; Senechal, Oulette, & Rodney, 2006).

L1-based research supports the existence of a positive relationship between language and reading comprehension in elementary school children (Chall, 1989; Carver, 1998). However, in terms of word recognition, the role of oral language proficiency seems to be rather limited and not uniform. Speece, Roth, Cooper and De la paz (1999) supported a weak link between oral proficiency and literacy development. In a longitudinal study, Storch & Whitehurst (2002) demonstrated that the relationship between oral language and reading development changes over time. They reported a strong relationship between phonological awareness and vocabulary during the preschool period. As children begin formal schooling, the relationship between the oral language and decoding abilities domains diminishes. In Grades 1 and 2, the relationship between oral language and reading ability is insignificant. However, the importance of oral language skills re-emerged in Grades 3 and 4, accounting for 7% of the variance in reading comprehension

It has been proposed that the association between vocabulary skills and decoding is due to an indirect role through phonological awareness. As more words are added to the lexicon, children must become more sensitive to sublexical detail, thus benefiting growth in phonological awareness (Metsala, 1999).

It seems that OLP has no direct effect when reading regular word but it has a direct effect when reading exception words in English. Children with poor semantic skills, but not phonological, have been reported to have difficulty reading exception words and in the development of automaticity (Nation & Snowling, 1998).

Similarly, in studies carried out in L1 transparent orthographies, it seems that OLP does not play any role in explaining word decoding abilities (Aartnoutse, Van Leewre, & Verhoeven, 2005).

2.5.2. The influence of L2 oral language proficiency in L2 word recognition

Estimates of the vocabulary knowledge of a six-year-old child vary considerably, but a commonly agreed upon range is 5,000 to 7,000 words (Chall, 1989). The L1 lexicon and syntactic knowledge are much more elaborated than the parallel L2 components. In addition, L2 children learn the new alphabet, the meaning of new words, and syntactic rules at the same time as they learn to recognize accurately the written form of these features.

One obvious implication of these differences in vocabulary is that having L2 students sound a word to "discover" its meaning is likely to be less effective than it is in L1 settings. In a study done for reading acquisition of adult students learning to read in Spanish as a second language, Villalva and Hernández (2000, p. 67) reported that the learner, after pronouncing the different syllables of a word, reads the word again more quickly to access the meaning. Ej: '*Ca-ba-llero, caballero, ¡ah! Caballero [gen-tle-man, gentleman, aah! Gentleman]*. As Grabe and Stoller (2002) state, L2 students cannot match a sounded out word to a word they know orally, because they do not yet know the word orally.

Similarly to studies in the L1, recent research suggest that decoding process can not be merely explained on the bases of L2 oral proficiency (Droop & Verhoeven, 2003; Durgunoglu et al., 1993; Geva & Siegel, 2000; Gholamain & Geva, 1999; Lesaux & Siegel, 2003; Lindsey, Manis, & Bailey, 2003; Muter & Diethlen, 2001;Verhoeven, 2000).

In all of these studies, word recognition was tested by reading aloud words and pseudo-words. Even when the outcome task was word reading efficiency, L2 word reading efficiency was just as efficient as for their native peers (Droop & Verhoeven, 2003; Geva & Yaghoub-Zadeh, 2006; Verhoeven & Vermeer, 2006).

In light of these findings, we can conclude that L2 children can attain the same L2 word recognition accuracy as children in L1.

2.5.2 The relationships between decoding, reading comprehension and oral language proficiency in L1.

Gough and Tunmer (1986), in their simple view of reading, proposed that the ability to comprehend what was read is the product of two sets of skills: those concerned with decoding and recognizing printed words and those involved with linguistic or listening comprehension. There is considerable support for this view in the literature (Gough & Hillinger, 1980; Snow, Burns, & Griffin, 1998).

The early attainment of decoding skills at the word level has been shown to accurately predict later reading comprehension. Good comprehenders have been found not only to decode words more accurately, but also decode them more rapidly than poor comprehenders (Perfetti & Hogaboam, 1975), converging with Adams's (1990) repeated assertion that successful word recognition must be quick and effortless. It is thought that deficient, slow, and energy-demanding decoding uses up so much of the reader's mental resources that he or she has little capacity left to carry out higher level processes of text integration and comprehension (LaBerge & Samuels, 1974; Stanovich 1986).

Logically, decoding skills are a precondition for reading comprehension, but not sufficient. Reading comprehension appears to involve processes beyond word decoding, and these processes are typically thought to be related to oral language comprehension (Gough & Tunmer, 1986; Nation & Angell, 2006). As Rayner et al. (2001, p. 43), state "The potential for comprehending a text is set by the ability to comprehend that same text when it is spoken".

Converging evidence suggests that the extent to which reading comprehension is dependent on listening comprehension varies with the level of reading development. As decoding skills becomes less resource demanding, listening skills start to influence reading ability (Stanovich, Cunningham, & Freeman, 1984). In a deep orthography like English, the level of comprehension of normal readers at approximately the end of first grade appears to be strongly affected by decoding skills (Gough & Hillinger, 1980; Chall, 1989; Juel et al., 1986; Ehri, 1992; Snow et al., 1998). Sawyer (1992) indicates that facility with the orthographic code is the "principal barrier" to comprehension in the first grade.

As children's decoding abilities become more proficient, differences in listening comprehension abilities should account for more variation in reading performance (Gough & Tunmer, 1986). In line with this finding, Catts, Hogan and Adolf (2005) reported that individual differences in word recognition accounted for little of the variance in reading performance beyond the fourth grade.

A shallow orthography on the other hand, would be predicted to result in a greater contribution in the early graders from listening comprehension. Oney and Durgunoglu (1997) reported that Turkish children, by the end of first grade, were at ceiling on both decoding and spelling. As for reading comprehension, only listening comprehension was a significant factor. De Jong and Leseman (2001) in a study with Dutch first graders reported that first grade students with high word decoding scores had a relatively low score on the reading comprehension test. A study by Muller and Brady (2001) compared the reading acquisition of Finnish and English. The results shows that listening comprehension contributes more strongly to first-grade reading performance than what has been reported for children learning to read in English.

To sum up, it seems that in shallow orthographies, when word recognition is performed effortlessly and accurately, it does not interfere with reading comprehension, and only listening comprehension becomes a predictor of reading fluency.

2.5.3 The relationship between decoding, reading comprehension, and oral language proficiency in L2

Section 2.5.2 reviewed how according to researchers, L2 oral language proficiency did not predict decoding abilities and L2 children could decode with the same accuracy than L1 readers. However, reading comprehension is an area of greater difficulty for L2 readers and L2 children perform at significantly lower levels than their monolingual peers on measures of reading comprehension (Aarts & Verhoeven, 1999; Abu-Rabia & Siegel, 2003; Droop & Verhoeven, 1998, 2003; Hutchinson, Whiteley, Smith, & Connors, 2003; Verhoeven, 1990; 2000).

Researchers have empirically demonstrated that reading comprehension processes may benefit more from the facilitation of L2 oral proficiency than word-based processes.

Droop and Verhoeven (1998, 2003) gave much importance to the role of oral language proficiency in reading comprehension because the L2 reading comprehension skills are more dependent upon lexical knowledge than the L2 decoding skills. Bilingual Turkish-Dutch children, although comparable in word recognition, performed more poorly in reading comprehension than their monolingual Dutch-speaking peers. The authors attributed this lower level of comprehension to the lower performance in syntactic ability and oral fluency. Measures of Dutch OLP included both expressive and receptive vocabulary tasks, and an expressive syntactic task. However, both for native speakers and for L2 speakers, decoding skills played only a minor role in the development of reading comprehension, and according to the authors, decoding and reading comprehension appear to develop as independent skills from third grade on (Droop & Verhoeven, 2003).

In agreement with these findings, studies have demonstrated a significant effect of oral language proficiency in L2 reading comprehension, although measures of L2 decoding predicting L2 reading comprehension were not analyzed. Geva and Ryan (1993) conducted a cross-sectional study with 73 students in Grades 5 to 7, who were learning to read in English (L1) and Hebrew (L2) concurrently. Regression analysis showed that Hebrew oral proficiency, as measured by teachers' global ratings, accounted for 29.8% of the variance on Hebrew reading comprehension scores. Carlisle, Beeman, Davis, & Spharim (1999) found that the vocabulary performances in L1 and in L2 accounted for 40% of the variance in the English reading comprehension, and phonological awareness accounted for 6% of the variance. Corresponding with these results, Lindsey et al. (2003) reported that receptive vocabulary was one of the best predictors of English reading comprehension, but did not account for variance in decoding.

However, Lesaux and Siegel (2003) reported different results. A study with ESL second graders of diverse linguistic background found that oral comprehension and naming were not significant predictors of reading comprehension performance, whereas rhyme detection explained 17% of the variance, and letter identification explained 7% of the variance. ESL children performed at levels comparable to those in their L1.

Similarly to studies in the L1, OLP seems to account for greater variance in reading comprehension once students become proficient in decoding skills. Proctor, Carlo, August, and Snow (2005) analyzed the role of English vocabulary, listening comprehension, and word reading fluency in L2 English reading comprehension among fourth-year intermediate-level Spanish-speaking ELLs. The authors observed that whereas vocabulary, listening, and L2 alphabetic knowledge exerted a role in reading comprehension, speed of decoding did not contribute to significant variance in the model.

In conclusion, the studies examining the relationship between OLP and basic reading skills do not yield consistent results. However, the relationship should not be dismissed due to these inconsistencies but further examined. The above studies were conducted with different age groups, different socioeconomic status, different language groups, under different learning conditions (L2/immersion, L2/concurrent), using different experimental designs, and using different measures for addressing OLP (e.g., vocabulary, listening comprehension, global teacher ratings).

3.0 THEORETICAL FRAMEWORK AND HYPOTHESIS

The main theoretical positions about second language literacy development have been reduced to two competing perspectives referred to by Geva and others (Geva & Siegel, 2000; Geva & Wade-Woolley, 1998; Gholamain & Geva, 1999) as the central processing hypothesis and the script dependent hypothesis. The first, the central-processing hypothesis, maintains that common underlying linguistic and cognitive processes (e.g., working memory, verbal ability, naming and phonological skills) influence literacy development across all languages and that children deficient in such processes are more at risk for developing reading difficulties than are those with good skills in these areas. The second, the script dependent hypothesis, posits that literacy acquisition varies across languages; in other words, literacy emerges out of the specific knowledge of the linguistic forms and orthographic principles of individual languages and is unique to each of the child's languages. Geva and Siegel (2000) concluded that both sources contribute significantly to children's reading acquisition in the L2. The fact that common underlying cognitive linguistic processing skills predicted literacy levels across the two languages compared (English and Hebrew) favors the central hypothesis, and the fact that reading accuracy varies across languages favors the script dependent hypothesis. Because of this, reading researchers must consider both language-specific elements and common factors shared across languages.

The present study, therefore, combines both hypotheses. Following the guidelines of the central processing hypothesis, common skills necessary for reading development were selected (i.e., phonological awareness, oral language proficiency, letter knowledge, print awareness, phonological decoding and sentence-reading comprehension). However, the main objective of this study is to inquire about the different relationships among those skills when children learn to read in Spanish as a second language, following the guidelines of the script dependent hypothesis.

Inquiry into the component processes involved in learning to read in Spanish as a second language is important because a small number of preliminary studies (Droop & Verhoeven, 2003; Geva & Siegel, 2000) have reported subtle but important differences among reading acquisition processes, depending on the depth or shallowness of a particular language. A considerable amount of research has been conducted on literacy development in shallow orthographies such as Dutch or vocalized Hebrew, but hardly any research has been conducted on learning to read in Spanish as a Second Language.

Most literacy models are based on L2 English-speaking children. In developing a model for L2 Spanish reading acquisition, two possible sources of variation from L2 literacy models will be proposed. In the first variation it will be determined whether L2 word recognition in Spanish consists of two underlying constructs or just one. In the second variation the effect of oral language proficiency on each of these two constructs will be studied. These model variations comprise the subject of my research.

To accomplish this dissertation's major intents, it would be advantageous to highlight the key findings from the existing research. Based on those findings, expectations to justify the above mentioned variations from L2 models will be addressed. Then, the expectations will lead the formulation of the hypotheses.

The first aim of this study is to determine whether decoding and meaning activation are more independent in transparent orthographies than in deep orthographies, and whether this independence is even greater when reading in a second language where the L2 lexicon is not so elaborated. The following findings related to this objective are listed below:

1. The basic requirements for acquiring decoding skills are the same across all languages, since the linkage of spoken language elements and units of graphic symbols is supported by concepts of print, phonological awareness, letter knowledge and orthographic knowledge. Those factors are the same when learning to read in either the L1 or L2 (Gholamain & Geva, 1999).
2. In L1, meaning activation is believed to occur automatically once the word has been sounded out (Stanovich, 1993).
3. L2 children do not have the same number of words stored in their lexicon as L1 children (Verhoeven, 1990).
4. In a shallow orthography, the mapping between the meaning and the written word is activated by the phonological route (Katz & Frost, 1992). Once students have learned some grapheme-phoneme correspondence, students may be able to pronounce a word accurately. Then, children's word decoding skills develop easily, with fewer repeated encounters with the word than in a deep orthography (Aro & Wimmer, 2003).
5. L2 children in transparent languages can read aloud both words and pseudo-words with the same degree of accuracy as in the L1 (Geva & Siegel, 2000; Droop & Verhoeven, 2003).

Based on these findings one would expect the following to be true in L2 Spanish word recognition development:

L2 students do not have the same number of words activated in their internal lexicon as do L1 students; therefore, the mapping between the retrieval of the phonological form and meaning activation may not occur as automatically as in L1 students.

Once the grapheme-phoneme correspondence has been learned, L2 students learning to read in a transparent language can read pseudo-words correctly. Then, the same process can take place when reading a real word. L2 students could read the words aloud as if they were pseudo-words, regardless of whether they understood the words.

L1 phonology activation brings together the graphic form and the meaning associated with the phonological form (Perfetti, 1998). L2 phonology activation in a shallow orthography may not activate the meaning of the graphic form automatically. L2 students can achieve the correct pronunciation, but there is no evidence that they understand what they are reading. The difference between meaning identification and phonological decoding can be explained by the following figure:

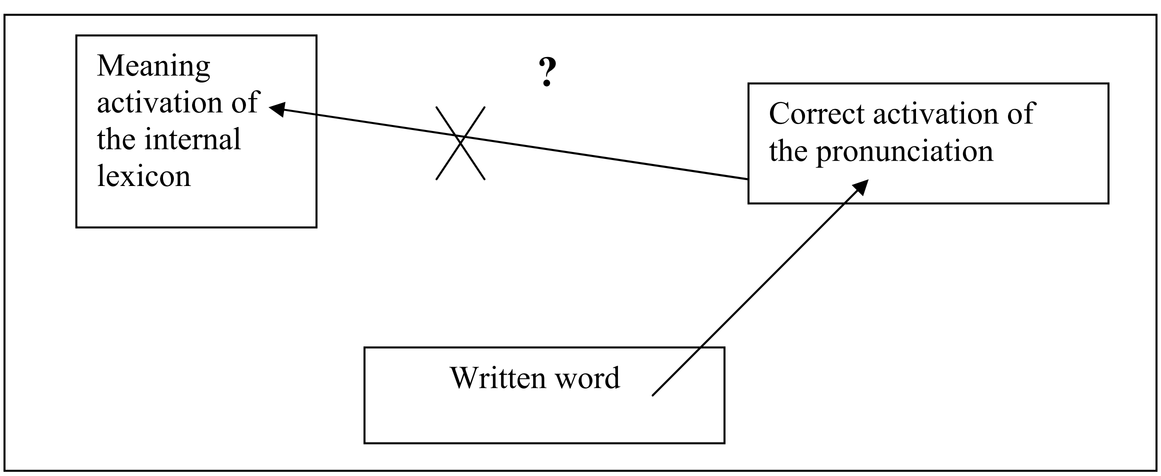

Figure 3.1: Possible development of meaning activation in the L2

Researchers dealing with L2 word recognition have used the same instruments as for the L1: the Ready-to-Read word test and the Woodcock Reading Mastery test. These tests are based on reading aloud pseudo-words and real words that increase in difficulty. When dealing with Spanish L2 readers, the validity of these word recognition tests can be questioned, as the scores might define the construct of decoding but not that of word meaning activation.

As stated above, one variation that I propose is that L2 Spanish word recognition could consist of two constructs instead of one. In this study word recognition skills will be divided into two constructs: decoding and meaning identification. The construct of decoding refers to the ability to transform printed letter strings into a phonetic code. Therefore, measurement involving reading both real and pseudo-words aloud will be used to test this construct. The construct of meaning identification is based on the ability to retrieve the meaning of a word. Picture-word matching and word-picture matching tasks will be used to test this construct. It is not possible to score well on the meaning activation tasks unless the words are understood. Figure 3.2 presents the confirmatory analysis model used to investigate this hypothesis:

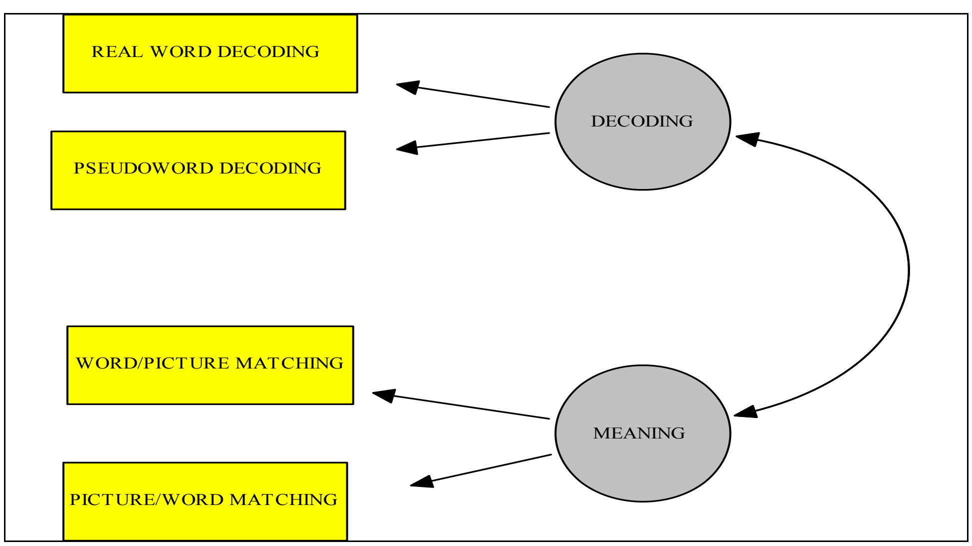

Figure 3.2: Confirmatory factor analysis model

It is hypothesized that performance in decoding will not equal performance in meaning identification. Performance in reading real words aloud and in reading pseudo-words would load highly on one factor, and performance in word-picture matching and picture-word matching would load highly on another factor.

The second aim of this study concerns the role of oral language proficiency in predicting decoding and meaning Identification tasks. From the existing research, the following points should be taken into account:

1. L1 and L2 oral language proficiency does not predict accurate performance of L2 decoding skills (Durgunoglu et al., 1993; Geva & Siegel, 2000, Droop & Verhoeven, 2003).
2. Word recognition occurs when the phonological form is recognized as belonging to the beginner's spoken vocabulary (Oney et al., 1997).

In accordance with previous studies (Durgunoglu et al., 1993; Geva & Siegel, 2000; Droop & Verhoeven, 2003), it is hypothesized that L2 oral language proficiency will not have a direct effect on L2 decoding in Spanish as second language. However, by measuring meaning identification, the role of oral language proficiency (OLP) could change. To achieve an accurate performance in meaning identification tasks, L2 students need to have heard and understood the word before. Orally proficient L2 children are supposed to have a high number of entries stored in their internal lexicon. Therefore, the students' performance in oral language proficiency measures will have a direct effect on meaning activation skills.

Finally, to confirm that word recognition consists of two constructs, it would be advantageous to analyze the impact of these constructs on higher level reading processes. Therefore, the final objective of this study was to examine the extent to which decoding, meaning activation and oral language proficiency have independent, direct influences on sentence comprehension.

Kintch and van Dijk (1978) distinguish between sentence comprehension and text comprehension. To understand a sentence, the reader has to articulate all the words composing that sentence in order to extract the meaning; understanding a text requires a more complex mixture of abilities that include drawing links between the different ideas contained in the sentences and paragraphs, and using connectors to choose the appropriate relations. Since the main focus of this proposal is on the predictive role of meaning identification, sentence comprehension has been selected as the dependent variable.

The following insights have been highlighted from the literature review:

1. Reading comprehension is composed of listening comprehension and decoding (Gough & Tunmer, 1986).
2. Good comprehenders must activate the meaning and the phonological form of a word automatically (LaBerge & Samuels, 1974).
3. L2 oral language proficiency has been reported to account for variance in L2 reading comprehension skills. L2 oral language proficiency accounted for greater variance than L2 decoding in L2 reading comprehension (Droop & Verhoeven, 2003).

When dealing with predictors of sentence comprehension, most of the existing research has considered the constructs of decoding and oral language proficiency. Gough and Tunmer (1986) defined decoding as the retrieval of semantic information at the word level. Here, it was assumed that decoding automatically included phonological activation and meaning activation.

In the first hypothesis of this study, it was predicted that L2 decoding in Spanish could be performed accurately in the absence of meaning activation skills. However, L2 sentence comprehension tasks require both decoding and meaning activation skills. Therefore, sentence reading comprehension should be predicted not only by decoding and oral language proficiency but also by meaning activation.

The general framework that links the present study's primary constructs of interest is shown in Figure 3.3.

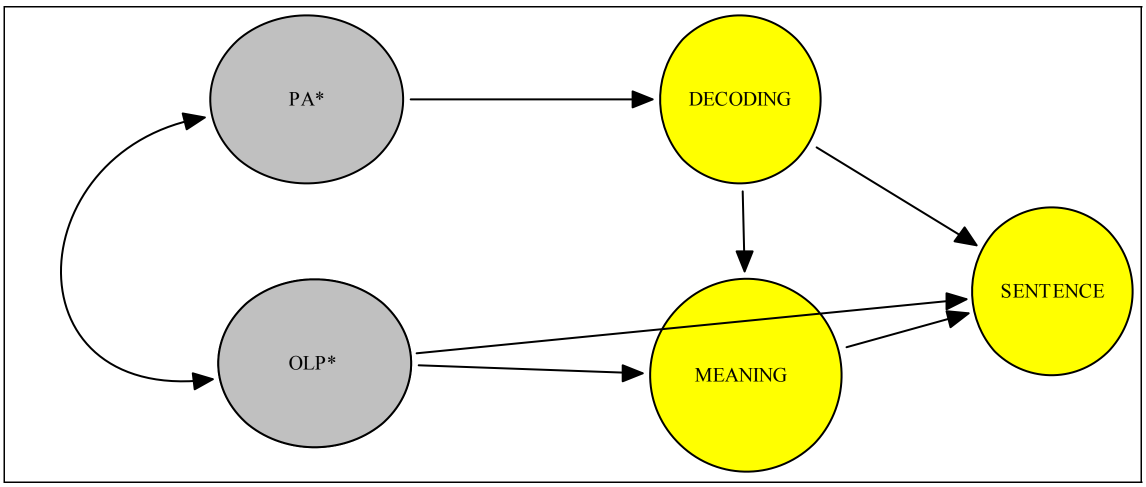

Figure 3.3: Structural Equation model used in this study

The two independent factors are PA and OLP; they are postulated as being correlated with each other and they are linked to decoding and meaning identification by a series of regression paths. According to this model, sentence reading comprehension derives from decoding, meaning identification and OLP. Decoding in turn derives from PA, whereas meaning identification derives from decoding and oral language proficiency.

In order to provide a good fit in the model, paths have been added based on previous research:

1. Phonological awareness (PA) has a direct effect on decoding (Durgunoglu et al., 1993; Geva & Siegel, 2000).

2. Decoding has a direct effect on meaning activation. This is based on the insight that the phonological form can be generated prior to the retrieval of meaning in transparent languages (Katz & Frost, 1992).
3. Oral language proficiency (OLP) and Phonological awareness (PA) correlate (Carlisle et al., 1999).

Another possible reading predictor, L2 syntactic awareness, has not been included in this study, as it might be confounded with oral language proficiency (see section 2.2.4).

3.1 MODELS AND HYPOTHESIS OF THE PRESENT STUDY

As stated in the theoretical framework, the main aim of the present work is to examine the extent to which decoding and meaning activation skills form separate constructs. The following confirmatory analysis model has been proposed:

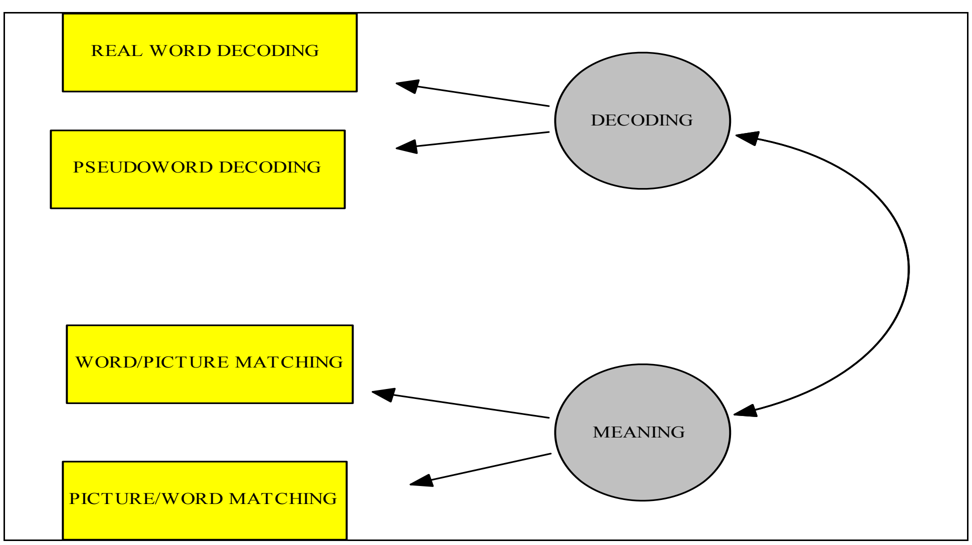

Figure 3.4: Confirmatory Factor Analysis model used to test the first hypothesis.

The secondary aim of this study is to test the role of oral language proficiency (OLP) with respect to the development of decoding and meaning identification skills. The tertiary aim is to test the effect of meaning identification, decoding, and oral language proficiency on sentence comprehension skills. A theoretical model linking those constructs has been proposed:

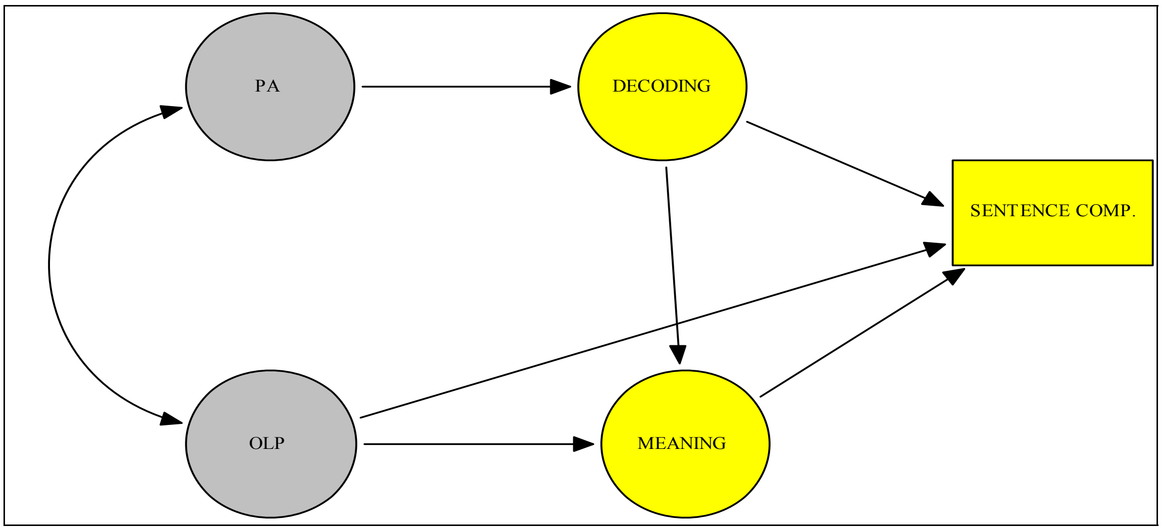

Figure 3.5: Structural Equation Model to test the last hypotheses

According to these two models, the following hypotheses have been proposed:

H1. Accuracy in L2 word decoding skills will not equal accuracy in L2 meaning identification

H2. L2 oral language proficiency in Spanish does not have a direct effect on decoding skills

H3. L2 oral language proficiency has a direct effect on word meaning identification skills

H4. Sentence reading comprehension is affected by phonological decoding, oral language proficiency, and meaning identification skills.

4.0 RESEARCH DESIGN AND METHODS

4.1 SUBJECTS

4.1.1 Target population and research site

The sample came from 227 second graders selected from 16 different public primary schools. All the students were Moroccan students.

The students ranged in age from seven to eight years old. Fifty-four percent of the participants were male (n=123) and 46% were females (n=104). All had received at least one year of Spanish education. The educational periods of the students in Spain varied from one to three years, and none of them were born in Spain.

The schools are located in two provinces in the southeastern part of Spain. One hundred thirty-eight students attended one of the seven schools in the province of Almería, while 89 attended one of the eight schools in the province of Murcia.

In the educational system in Spain, first graders and second graders form the initial stage of primary education. They have the same teachers during those two years and the same developmental objectives. A first grader is not allowed to repeat a grade the first year, only at the end of the second year. Most of the evaluation takes place during the second year. From piloting, we could see that very few of the Moroccan first graders could score well on the decoding and sentence comprehension tasks. Therefore, in order to avoid the floor effect, it was decided to use only second graders.

All the students in the study received formal school instruction in Spanish only and none received Special Education Services. All attended special instruction in Spanish as a Second Language a few hours a week.

All of the schools interviewed were state schools. There are almost no immigrant students inscribed in private schools, and this sometimes results in the concentration of immigrants in specific schools (López, 2004). Moroccan students are normally assigned in groups of three or four Moroccans per class, out of 30 total students. Classes have a certain number of other minority students such as Romanians, Lithuanians and Senegalese (one or two per class); there is also a noticeable presence of gypsy students. Since the student population is so varied, teachers often make curricular adaptations in attempts to keep up with the reading demand of the school curriculum. Most of the reviewed studies show that Moroccans fail in school and tend to repeat a grade (Franzé, 1999; Gari, 2001). In one study carried out in the province of Murcia, it was demonstrated that 99% of the Moroccan students do not pass secondary education (Franzé, 1999).

4.1.2 Defining the sample

The students represented an economically disadvantaged population as determined by the fact that all of the students participated in free lunch programs.

As there was no opportunity to interview the parents and the students directly, information concerning the parents' print environment was gathered from two data sources:

“The Atlas de inmigración magrebí en España, 2004” [Atlas of Maghrebí immigration in Spain, 2004] and from ‘The Informe sobre la Red de Menores Extranjeros Escolarizados en Andalucía” [Report about foreign minors schooled in Andalucía] conducted by Aparicio (2003) for the Spanish Ministry of Labor and Social Affairs.

The Atlas of Maghrebi immigration in Spain yielded information about the places of birth and residences of emigrants in Morocco, as well as their places of settlement in Spain. According to this source, most of the Moroccan immigrants who settle down in these provinces come from the northern regions of Morocco. These are among the poorest areas in Morocco and are where Berber is spoken. Thus, from this data we can infer that all participants spoke Moroccan or Berber as their first language (L1) and Spanish as their second language.

The report about foreign minors schooled in Andalucía collects data from 299 Moroccan parents. It does so in a survey conducted in 60 infant and primary schools in the provinces of Málaga, Almería and Seville in Spain. Some of the schools in Almería were the same as in our study. Some of the main points of this report concerning the Moroccan population are as follows:

•The majority of the Moroccan women work in domestic services, while men work in agriculture, construction, and the service industries.

•The educational level of the Moroccan parents is very low. Forty-one percent of the fathers did not atttend primary education in Morocco, 42% only finished primary school and only 5% attended secondary school. None of the Moroccan parents studied at university. The Moroccan mother’s educational level is even lower: 53% did not attend primary education, only 35% finished at the primary level, and none of them attended secondary school. 11% of the Moroccan women interviewed stated that they did not know their level of studies.

•The parents’ competency in Spanish is also very limited. A majority of 47% answered that their Spanish level of fluency was highly limited. Another 21% answered that their Spanish was “enough,” and 32% indicated that their Spanish was sufficient.

•The Moroccan families tend to group together exclusively among their own community; they do not relate to other immigrants or Spanish people. This behavior is also noticeable in Moroccan children, who tend to mix only with children of their own nationality.

•The report emphasized that the Moroccan children hardly ever complete their homework at home. Forty-two percent never do their homework, 50% do their homework insufficiently and only 7% do it correctly.

Moroccan girls usually leave school at the onset of puberty because their presence in a co-educational institution after this age is not acceptable to the family, and a high percentage of the boys drop out of the school as well, because they are expected to work to bring some money into the family when they are only 15-16 (Gari, 2001).

As we have observed, the socioeconomic characteristics and culture of the Moroccan immigrants do not seem to favor either the development of L2 oral language proficiency or the development of pre-literary skills.

4.2 TESTING INSTRUMENTS

Due to the literary review and prior analyses, the 11 measures have been grouped into five statistically and conceptually meaningful factors: phonological awareness, oral language proficiency, decoding, meaning identification, and sentence comprehension. Print knowledge measures will also be used for cut-off points. All the tasks and measures have been summarized in the table provided in Appendix A.

4.2.1 Spanish oral language measures

In our operational definition section, oral language proficiency was defined as constructed by two dimensions: *oral vocabulary*, defined as the ability to recognize the phonological label of a word and then associate it with a concept, and *listening comprehension,* defined as the ability to comprehend oral language in context.

4.2.1.1 Oral vocabulary measures

The Test de Vocabulario en Imágenes (TVIP; Dunn, Padilla, Lugo, & Dunn, 1986) was used to assess receptive vocabulary. The TVIP is the Spanish version of the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981), and it was normed in Mexico, Puerto Rico, and Spain. Dunn et al. (1986) report split-half reliability coefficients ranging from .80 to .95. This task was administered individually. There are 175 items on the test.

The child was shown four pictures on a page (e.g., dog, brush, chair, car) and was then asked to point to one item (e.g., “Can you point to the picture of a chair?”). When 6 out of 8 consecutive responses were incorrect, the task was discontinued. Each correct response received one point.

4.2.1.2 Listening comprehension measures

Two tasks were being used to analyze listening comprehension:

- A subtest of the Pre-LAS (Duncan & de Avila, 1986). An audio tape read ten directions like “Simons says to move your hand,” and students had to perform the instructions according to what they had heard.

-The sentence listening comprehension subtest of the Aprenda: La Prueba de Logros en Español - 2nd Edition (Harcourt Brace, 1998). The objectives measured in this test are the same as those measured by the Stanford Achievement Test, 9th edition (Psychological Corporation, 1998). It consists of 10 sentences read by the researcher. The children had to match the sentences with pictures, e.g., “Mark the picture where the girl is jumping”. This test was administered using a paper and pencil test in groups.

4.2.2 Spanish phonological awareness measures

As stated in the previous section, we defined phonological awareness as a multi-dimensional construct. For this study, phonological awareness was divided in two components: *early phonological awareness,* defined as the ability to identify the intrasyllabic elements of the spoken word and *late phonological awareness,* defined as the ability to manipulate the phonemes of the spoken word.

-Early phonological awareness: In order to test intrasyllabic phonological awareness, an oddity task was used. This test was created by Jiménez and Ortiz (2001). It consists of identifying onset and rimes in syllables. Students were presented with three syllables, and they chose the onsets or rimes that were different, e.g., “Let’s have a game of nonsense words. I’ll tell you three nonsense words, and you must tell me which word sounds different”. This task consisted of sixteen items. It was administered individually (see Appendix B).

-The task to measure late phonological awareness was a phoneme blending task. This instrument was originally developed by Jiménez and Ortiz (2001). Students heard a word broken into individual phonemes and blended the sounds together to say the word. The examiner presented each item by saying “Let’s play a game; it is a game where you have to guess the word. I am going to tell you the words in a secret code, and you have to tell me what word it is”. The task consisted of fifteen items, and it was administered individually. Three sample items were given. The test was discontinued if the child was unable to respond correctly to any of the first eight items (see Appendix C).

4.2.3 Spanish decoding measures

Phonological decoding was defined as the ability to pronounce words and pseudowords when seen in print.

-The sub-test version of the PROLEC (Evaluación de los procesos lectores) [Assessment of reading skill test for children] (Cuetos, Rodriguez, & Ruano, 2002) was used. This is a standardized battery test that is used in Spain to diagnose reading skills with native speakers. It consists of 30 common Spanish words from Spanish basal reading series books and simple storybooks. The words vary in complexity and are divided in six groups of CCV, VC, CVC, CVV, CCVC, CVVC.

There were three sample words, and then the child read aloud the 30 remaining words. The children had to read the words at their own pace and were told to skip those they cannot read. One point was given for every word that was read correctly. When the child made more than eight mistakes, the test was discontinued.

According to the authors (Cuetos et al., 2002), the average for a native Spanish speaker is 26.9 out of 30 for first graders and 29.2 for second graders. This task was administered individually.

- For pseudo-word decoding, the sub-test version of the PROLEC was used. It also consists of 30 pseudo-words divided into the same groups of complexity as the real words. The same procedure as with word decoding was used. According to the authors (Cuetos et al, 2002), the average number of correct answers for a native speaker is 25.4 out of 30 for first graders and 28.8 for second graders.

4.2.4 Spanish meaning identification measures

This construct has been operationally defined as the retrieval of a phonological form and the activation of meaning of a word seen in print. The following measures are proposed to test this construct:

- Reading vocabulary. A written version of the Peabody Picture Vocabulary Test was used. Students had to match pictures to the corresponding target word. There are 175 items on the test. The children's task was to read the printed word aloud and mark the matching picture. This task was administered individually. The same procedures as in the Peabody Picture

Vocabulary Test were used. When 6 out of 8 consecutive responses were incorrect, the task was discontinued. Each correct response received one point.

- Word-picture matching. The Word Reading sub-scale of the Aprenda test was used. This task is an adaptation of the Stanford Achievement Test (Psychological Corporation, 1989). Students had to match three possible words with a corresponding picture. There are 30 items on the test. This task was administered in groups.

4.2.5 Spanish sentence comprehension measures

Sentence comprehension has been defined as the ability to retrieve information from a sentence and to interpret it appropriately. To test this construct the sentence reading comprehension subtest of the PROLEC (Cuetos et al., 2002) was used. It consisted of twelve sentences. In three of the sentences, the child had to perform the action in the sentence according to what was read, e.g., "Point to the notebook with your pencil". In the next three sentences, the child was asked to select from the pictures, e.g., "The boy is fatter than the girl", and finally, the child was requested to make a drawing, e.g., "Draw three clouds and a sun". The six questions about performance and pointing to the picture were administered individually, and the other six were administered in the class as a paper and pencil test. According to the authors (Cuetos et al., 2002), the average number of correct answers for a native speaker was 10.1 out of 12 for first graders and 11.4 for second graders.

4.2.6 Print knowledge measures

Print knowledge is a construct formed by concept of print and letter knowledge. The following two tests were used.

- Measure of letter knowledge. This task was adapted from Cuetos et al. (2002). PROLEC (Prueba de evaluación de los procesos lectores) [Assessment of reading skill test for children]. The test consisted of 20 lowercase letters (the authors omitted the vowels because of high frequency and the 5 letters that were the most infrequent ones: x, w, rr, h, k). The score ranged from 0 to 20. This task was administered individually. Children were asked to provide either the letter name or the sound. According to the authors, the average punctuation for native speakers was 19.5 for first graders and 19.8 for second graders.

- Measure of concept of print:This task is an adaptation of the English language version of Clay's (1979) concepts about print. The book, *Sígueme, Luna*, an adaptation of the book *Follow Me, Moon* (Clay, 1979) was used. The child was asked the 15 questions assessing knowledge of the book and printing conventions, such as "point to the front of the book", "where does one start reading?", "which direction along a line does one read?" etc. The original test consists of 24 questions. Nine questions were omitted as some decoding knowledge is necessary in order to answer them accurately.

4.3 DATA COLLECTION PROCEDURE

Data collection took place over a two-month period during the third school term.

Permission to conduct the study was first obtained from the school district administration and from the school principals and then from the Institutional Review Board of the University of Pittsburgh.

Students were administered tasks during individual and group sessions. Individual testing took place in two sessions for approximately 30 minutes each, in a school-designated location. Large-group testing took place in the Spanish as a Second Language classroom. Group testing took place on the same day as individual testing or the following day.

The individual tasks were administered in the following order: Spanish Letter Knowledge, Print Knowledge, Real-word Decoding, Oral Vocabulary, and in the second session: Pseudoword Decoding, Intra-syllabic Awareness, Blending and Reading Vocabulary.

Eighty-six students (38%) who did not pass a cut-off point of 80% of correct answers in the control tasks Spanish Letter Knowledge and Print Knowledge were not included in the following analysis. One hundred forty-one students (76 boys and 65 girls) passed the control tasks and were included in the study.

5.0 RESULTS

5.1 OVERVIEW OF THE STATISTICAL ANALYSIS

The following hypotheses were tested in this study

H1. Accuracy in L2 word decoding skills will not equal accuracy in L2 Meaning Identification

H2. L2 oral language proficiency in Spanish does not have a direct effect on decoding skills

H3. L2 oral language proficiency has a direct effect on word meaning identification skills

H4. Sentence reading comprehension is affected by phonological decoding, oral language proficiency, and meaning identification skills.

Research findings presented in this study consist of four parts. The first part presents descriptive and univariate statistics as well as bivariate correlations that were used to check for missing values and to test assumptions required for factor analysis and structural equation modeling. The second part presents evaluation of the first hypothesis through exploratory and confirmatory factor analysis. Third, the results of the measurement model are presented, along with an alternative measurement model. Finally, Hypotheses 2 through 4 are discussed with the finalized SEM model.

SPSS and EQS 6.1 (Bentler, 1995) were used to conduct all statistical analyses. To test the first hypothesis, confirmatory factor analysis was used. To test Hypotheses 2 through 4, structural equation modeling with latent variables was used.

Regarding sample size, according to Boomsma (1982) SEM is appropriate for sample sizes over 100. Bentler and Chou (1987) noted that researchers can go as low as five cases per free parameter. As we have 25 free parameters in our model, the number of 140 should be appropriate.

Raw scores were used for data because the measures used in the study did not have standardized normative information for a Spanish L2 population.

5.2 DESCRIPTIVE STATISTICS AND PRELIMINARY ANALYSIS

A number of data screening procedures were conducted using SPSS. Following Tabachnick and Fidell's (2001) recommendations, the accuracy of input data was checked by examining missing data, out of range values, plausible means and univariate outliers. The means and standard deviations of each task were found to be within an appropriate range. The minimum and maximum values, means and standard deviations appeared plausible (see Table 5.2.1).

5.2.1 Missing data:

A small percentage of the data was missing 2.8% on the late phonological awareness task (blending), 1.4% of the data of the early phonological awareness tasks, and also 0.7% of the word-picture matching task. Since the EQS program requires that there are no missing data, the missing values were replaced by the variable mean. The data were missed at random, as some of the students did not turn up on the day of that particular test.

5.2.2 Univariate outliers:

The frequency of the distribution of the z scores was examined. Since there are more than 80 cases, the criterion for identifying a univariate outlier is ±3.0 standard deviations from the mean (Kline, 1998). There are no z scores greater than ±3 so no outliers were identified.

5.2.3 Multivariate outliers:

Potential multivariate outliers were identified with the Mahalanobis distance statistic (Kline, 1998). As in our final model we have seven variables, the critical value of χ^2 at the .001 level is 24.32. There was one case that exceeded the 24.32 value and it was eliminated from the data.

5.2.4 Normality:

Distribution of the variables was examined for kurtosis and skewness. Using SPSS, we divided the skewness and kurtosis value of every variable by the standard error for skewness and kurtosis. Normal skewness and kurtosis should be within the +3 to -3 range when the data are normally distributed (Tabachnick & Fidell, 2001). Positive skewness was found for the variables: real-word decoding, pseudoword decoding, listening, and word-picture matching. These results are expected as we established a cut-off point of 80% on the control variables.

Although one way to deal with non-normality of data is to transform the scores, some statisticians caution against using transformations because it changes the interpretation of the data (Tabachnick & Fidell, 2001). Furthermore, EQS, the software used for confirmatory factor analysis and SEM analysis, allows one to request statistics that provide robust chi-square statistics (χ^2) called the Satorra-Bentler statistics (S-B χ^2; Satorra & Bentler, 1988). This robust chi-square does not assume an underlying normal distribution of the sample. Thus, none of the variables were transformed.

Bivariate scatterplots were checked for nonlinearity and heteroskedasticity. As the correlation coefficients between all variables are statistically significant, it can be concluded that all the relations are largely linear.

Homoskedasticity can be checked by visual examination of a plot of the standardized residuals. Heteroskedasticity was found when dealing with the variables that had been diagnosed with positive skewness: real-word decoding, pseudoword decoding, listening comprehension, and word-picture matching. Hetoroskedasticity is related to non-normality, as the variance of errors is not the same across all levels of the variables (Tabachnick & Fidell, 2001). The Satorra and Bentler (1988) robust method corrects the model fit chi-square test statistic and the standard errors of individual parameters. Therefore, the standard errors, and test statistic should be corrected by applying this test (Chou, Bentler & Satorra, 1991).

Table 5.2.1: Means, Standard Deviations and Distribution of All the Observable Variables

Latent Variable Observed variables (scale)	Mean	SD	Minimum	Maximum	Skewness	Kurtosis
Phonological Awareness						
Blending (correct items out of 15)	6.95	4.43	0	15	0.06	-1.07
Intra-syllabic awareness (correct items out of 16)	8.16	3.78	0	16	0.17	-0.75
Oral Language Proficiency						
Listening Comprehension (correct items out of 22)	19.37	2.66	12	22	-0.77	0.43
Oral Vocabulary (correct items until students make 6 consecutive mistakes)	43.22	16.51	7	84	-0.03	-0.12
Decoding						
Real-word Decoding (correct items out of 30)	24.91	8.27	1	30	-1.60	-1.07
Pseudoword Decoding (correct items out of 30)	23.20	9.25	0	30	-1.42	-0.56
Meaning identification						
Word Picture Matching (correct items out of 30)	24.20	5.68	7	30	-1.35	1.21
Reading Vocabulary (correct items until 6 consecutive mistakes)	41.50	24.20	0	92	0.11	-0.56
Sentence Comprehension						
Sentence Comprehension (correct items out of 12)	6.87	3.94	0	12	-0.46	-0.93

5.2.5 Bivariate correlations and the analysis of multicollinearity:

To investigate the relationship among reading variables, correlations were examined looking for similarities and differences among the variables (see Table 5.2.2). The highest correlation is detected in the relationship between real-word and pseudoword ($r = .98$, $p < .01$). These two variables are both highly correlated with the sentence comprehension variable ($r = .81$, and $r = .81$). The variables that form the meaning identification construct, word-picture matching and reading vocabulary are highly correlated with the sentence comprehension variable ($r = .76$ and $r = .84$) as well.

Table 5.2.2: Correlation Matrix of the Observed Variables

Measure	1	2	3	4	5	6	7	8	9
1. Real-word	--								
2. Pseudow	.98**	--							
3. In.sy.pa	.42**	.44**	--						
4. Blending	.51**	.50**	.55**	--					
5. Oral.Voc	.35**	.37**	.40**	.43**	--				
6. List.Comp	.36**	.35**	.40**	.35**	.69**	--			
7. Read.Voc	.71**	.71**	.43**	.50**	.71**	.66**	--		
8. Word.pic	.75**	.75**	.40**	.46**	.57**	.57**	.71**	--	
9. Sentence	.81**	.81**	.49**	.51**	.63**	.62**	.84**	.76**	--

** .Correlation is significant at the 0.01 level (2-tailed)

Multicollinearity has been defined as high correlations among the independent variables (Grewal, Cote, and Baumgartner, 2004). In our confirmatory analysis model, the two highly correlated variables, real-word decoding and pseudoword decoding, work as dependent variables. Therefore, there is no danger of multicollinearity. These two particular observed variables are being employed as effect indicators that depend on a latent variable (see Figure 5.3.2., p. 71). Effect indicators associated with the same concept should be positively correlated with one another; a low correlation suggests poor reliability (Bollen & Lennox, 1991). Therefore, the high correlations between these two observed variables are beneficial for exploratory and confirmatory factor analysis but not for the analysis of SEM with latent variables where one of the variables should be deleted.

5.3 TESTING THE FIRST HYPOTHESIS

H1 Accuracy in L2 word decoding skills will not equal accuracy in L2 Meaning Identification

To test this hypothesis, exploratory and confirmatory factor analyses were employed.

5.3.1 Testing through Principal Component Analysis

A Principal Component Analysis was conducted on the correlation matrix to determine whether decoding or meaning activation are two constructs or just one. The following variables were selected to run the analysis: pseudoword decoding, real-word decoding, reading vocabulary, and word-picture matching.

The data set met the necessary threshold for conducting a factor analysis (KMO=.77, Bartlett's Test of Sphericity= 656.63, df=6, p=000).

Direct oblimin rotation was requested, as there was a high correlation between the variables (Gerbing & Hamilton, 1996). As reported in Table 5.3.1, Principal Component Analysis yielded one clear factor accounting for 82.33% of the variance; the second factor explained only 9.86% of the variance. As only one component was extracted, the solution could not be rotated.

Due to the high correlation among the four variables, the one-factor solution is not surprising. One explanation for this result is the fact that Principal Component Analysis does not differentiate between common and unique variance (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Besides, in Principal Component Analysis we are dealing with formative measures rather than reflective measures, the implication being that the measures are causing the construct, rather than vice versa (Edwards & Bagozzi, 2000).

Table 5.3.1: Results of the Principal Component Factor Analysis

	Initial Eigenvalues			**Extraction Sums of Squared Loadings**		
Component	Eigenvalues	Variance %	Cumulative %	Eigenvalues	Variance %	Cumulative %
1	3.306	82.651	82.651	3.306	82.651	82.651
2	0.388	9.696	92.347			
3	0.283	7.086	99.433			
4	0.023	0.567	100.000			

Another exploratory factor analysis was carried out using maximum likelihood. The same result was obtained as in Principal Component Analysis; only one factor was extracted. This solution of one factor can be explained because in Exploratory Factor Analysis all the variables load on all factors and no imposition on the data should be made (Crowley & Fan, 1987). In Exploratory Factor Analysis the first component extracts common variance; the second component extracts the maximum variance of the remaining variance and it is uncorrelated with the first component, therefore it follows a "variance explained" criterion (Long, 1983). Accordingly, when the researcher predicts a model where one construct can be dependent on the other, Exploratory Factor Analysis is useless, as one factor can explain all the variance (Rubio, Berg-Weger, & Tebb, 2001). In this study, it is theoretically possible that there is a relationship of dependence among the constructs. The meaning identification construct is clearly dependent on the decoding construct, as in order to perform this task accurately students not only have to know the meaning of the word but also to decode it properly. Rubio et al. (2001) concluded that EFA is "a poor ending point for the construction of unidimensional scales…not only does EFA underfactor, but it combines the highly correlated variables into the same factor" (p. 614).

Therefore, an Exploratory Factor Analysis might not be useful for this study, as the two constructs might be different, but related and dependent one on the other. In Confirmatory Factor Analysis the fit criteria is used instead of the variance explained criteria. Since the number of latent variables and the relationship among the factors must be specified in advance, Confirmatory Factor Analysis should be used for this study.

Table 5.3.2: Results of the Maximum Likelihood Factor Analysis

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Eigenvalues	Variance %	Cumulative %	Eigenvalues	Variance %	Cumulative %
1	3.306	82.651	82.651	3.050	76.248	76.248
2	0.388	9.696	92.347			
3	0.283	7.086	99.433			
4	0.023	0.567	100.000			

5.3.2 Testing through Confirmatory Factor Analysis

When testing Confirmatory Factor Analysis we should take into account the high degree of correlation between pseudoword decoding and real-word decoding (r = .97). As discussed in the previous section, multicollinearity is not acceptable when it occurs among exogenous variables and when we are using two highly correlated variables in the prediction of a dependent variable (Grewal, Cote, & Baumgartner, 2004). However, in this analysis the observed variables that are highly correlated, pseudoword and real-word decoding, are considered as endogenous variables and both of them are indicators of the same construct, which is appropriate (Bollen & Lennox, 1991).

Thus, two competing models regarding the relationship between decoding and meaning identification have been put forth, that is, that either decoding and meaning identification should be treated as two separate but related constructs, or that they should be treated as a single construct. Using CFA, the two competing a priori models can be empirically investigated to see how each model fits the data. Four observed variables were used to conduct both analyses.

Table 5.3.3 presents the covariance matrix used for the four variables employed in both models.

Table 5.3.3: Covariance Matrix of the Four Variables (N=140)

	Real-word	**Pseudoword**	**Read.voc**	**Word.pic.**
Real-word	63.381			
Pseudoword	74.730	85.504		
Read.vocab	143.043	160.550	598.871	
Word.pic	35.114	39.315	98.460	32.233

Models for this study were fitted to the data though EQS 6.1 and the analysis was based on the variance-covariance matrix. EQS uses four types of variable names, V,F,E,D. The variables in an input file are measured; that is, they are observed variables. The measured variables (enclosed by boxes or rectangles) are called V1, V2, V3, and so on, in the order of the input file. Every dependent variable has an E, or Error variable. It is a residual variation in a measured variable, which is not explained by the predictor of the measured variable. An F type variable, Factor, refers to a latent variable enclosed by circles or ellipses. A factor represents the common variation among a set of observed variables (Schumacker & Lomax, 2004). The last type of variable is a D-type variable, Disturbance. It is a residual variation in a factor, which is not explained by predicting factors or variables.

In EQS, arrows indicate the relationship among variables and factors. A curved two-way arrow is used to represent covariance or correlation between factors. Lines directed between a factor and a particular observed variable denote the relationship between that factor and that measure, a factor loading. Numbers written on arrows are called path coefficients and they indicate the effects of one variable on another variable (Schumacker & Lomax, 2004).

In these models, the observed variables are all endogenous variables, whereas the latent variables are all exogenous variables. The variance of the factors was fixed at 1.0, and the paths from each factor to its measure variable indicator were set free to be estimated. Thus, the covariance between the factors can be interpreted as the correlation. The correlation between the two latent variables is free to be estimated. The one and two-factor solutions are depicted in Figures 5.3.1 and 5.3.2. Standardized path coefficients are displayed in the EQS figures.

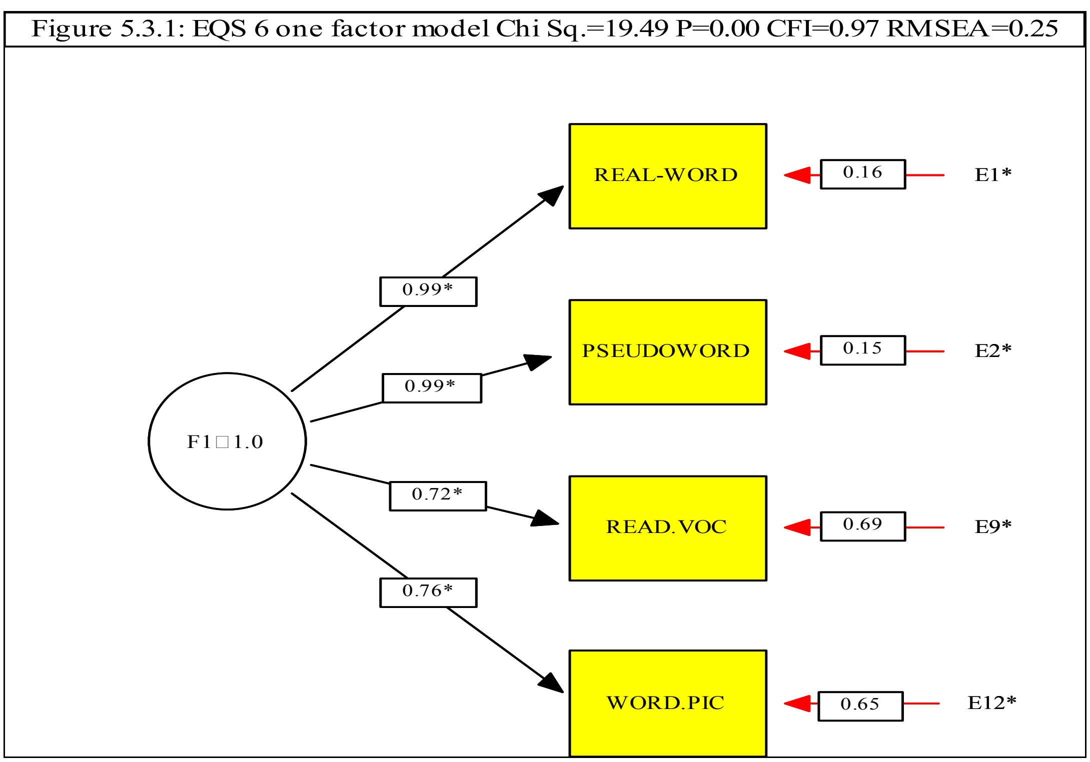

Figure 5.3.1: CFA one factor model and standardized path coefficients

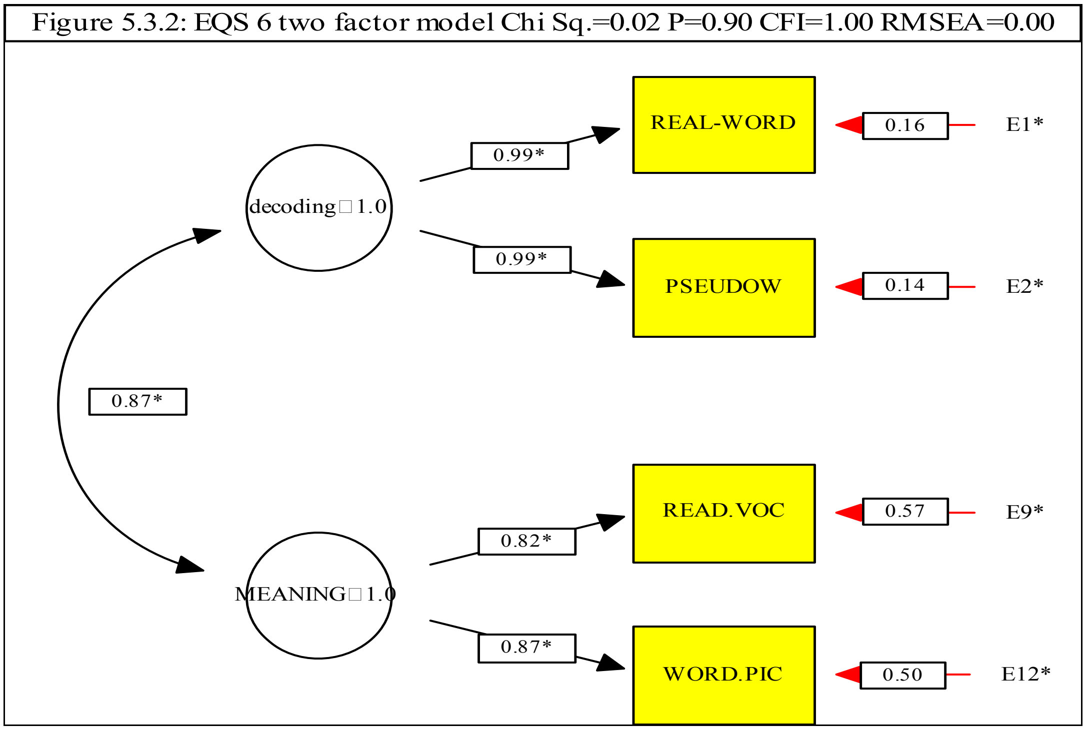

Figure 5.3.2: CFA two-factor model and standardized path coefficients

Tables 5.3.4 and 5.3.5 display information about the standardized factor coefficients and squared multiple correlations of each model.

Table 5.3.4: Factor Loadings and R-squared for the One-Factor Model

STANDARDIZED FACTOR LOADINGS				R-SQUARED
REAL-WORD=V1 =	.988*F1	+	.157 E1	.975
PSEUDOWORD=V2=	.989*F1	+	.146 E2	.979
READ.VOC=V9 =	.720*F1	+	.694 E9	.518
WORD.PIC=V12 =	.760*F1	+	.650 E12	.578

Table 5.3.5: Factor Loadings and R-squared for the Two-Factor Model

STANDARDIZED FACTOR LOADINGS				R-SQUARED
REAL-WORD=V1 =	.987*F1	+	.158 E1	.975
PSEUDOWORD=V2=	.990*F1	+	.143 E2	.980
READ.VOC=V9 =	.819*F2	+	.574 E9	.671
WORD.PIC=V12 =	.865*F2	+	.501 E12	.749

F1= Decoding, F2= Meaning Identification

Both in the one-factor model and in the two-factor model, all of the variables loaded significantly on their respective factors, providing support for the convergent validity of these constructs (Anderson & Gerbing, 1988).

In the two-factor model solution each factor's validity and reliability was assessed using the standardized factor loadings from the EQS 6.1 maximum likelihood solution. Cronbach's alpha for each factor was calculated to test if indicators for a latent construct belong together. A common rule of thumb is that indicators should have a Cronbach's alpha of .7 to judge the set reliable (Nunnally, 1978). In addition to assessing the Cronbach alpha for each factor, composite reliability value (also known as construct reliability) and the average variance extracted (AVE) were calculated. Composite reliability is a measure of internal consistency comparable to coefficient alpha. In this analysis the two factors reported a composite reliability score above .7 which is adequate for research (Fornell & Larcker, 1981, Bagozzi & Yi, 1988). The AVE measures the variance captured by the indicators relative to measurement error. If AVE is less than .5 the variance due to measurement error is larger than the variance captured by the construct (Fornell & Larcker, 1981). The values of composite reliability and AVE are shown in Table 5.3.6; all values exceeded the acceptable minimum, providing additional confidence that the measurement of the constructs is reliable.

Table 5.3.6: Coefficient Alpha, Construct Reliability and Variance Extracted Estimates

	Coefficient Alpha	Construct Reliability	Average Variance Extracted
Decoding	.99	.98	.96
Meaning	.83	.83	.71

5.3.2.1 Comparing χ^2

In judging whether one model is significantly better than another, Byrne (1994) noted that the change in χ^2 for nested models can be considered. The difference in χ^2 between the one and the two-factor model is 19.48 with 1 degree of freedom. Thus, the χ^2 difference is statistically significant at $p < .05$. Accordingly, the first piece of information used to assess model fit suggests that the two-factor model provides a better fit to the data.

5.3.2.2 Comparing the fit indices

The χ^2 is sensitive to sample size; therefore Bentler and Bonnet (1980) suggested that the ratio of the chi-square to the degrees of freedom should be used. This ratio should not be bigger than 2.2 for models with a good fit (Kunnan, 1998). As the data was non-normal, with a high degree of skewness and heteroskedasticity, the Satorra-Bentler scaled chi-square statistic and its significance levels were used, as it corrects the model fit chi-square test statistic and standard errors of individual parameter estimates (Satorra & Bentler, 1988).

The fit of the models was evaluated according to the information from the fit indices, following recommendations made by Hoyle and Panter (1995), Hu and Bentler (1998, 1999) and Raykov and Marcoulides (1999).

The Satorra-Bentler Non-Normed Fit Index (R-NNFI) (Bentler & Bonnet, 1980) was included, as it compares the model to one in which the observed variables are unrelated, and also takes into account the degrees of freedom of the model. Therefore, the NNFI was chosen, as it penalizes model complexity and awards model parsimony. The comparative fit index (CFI) (Bentler, 1990) and the root mean standardized error of approximation (RMSEA) (Steiger, 1990) were also included, both of which are based on the noncentrality parameter, an indicator of the degree to which the model does not fit the data (Raykov & Marcoulides, 1999). The RMSEA also offers the benefit of being relatively unaffected by sample size. Additionally, because of the small sample size, the Standardized Root Mean Square residual (SRMR), another fairly widely used index, was reported. The SRMR is a standardized summary of the average covariance residuals. According to Hu and Bentler (1999) the SRMR is the fit index most sensitive to misspecification. A cutoff value close to .08 for SRMR is needed before we can conclude that there is a relatively good fit between the hypothesized model and the data (Hu & Bentler, 1998).

Table 5.3.7 presents the fit statistics associated with the two models fitted to the data. Assessment of the fit indices also suggests that the two-factor model provides a better fit to the data in hand. Fit indices for the one-factor model are generally below the two-factor model. In the one-factor model the robust $\chi^2/df = 12.5$ is above the 2.2 accepted value. Values of Robust NNFI= .80 and CFI= .93 are indicative of a bad fit of the one-factor model as they are below the acceptable range of model fit (CFI and NNFI >.95) (Schumacker & Lemax, 2004). The RMSEA is equal to .29, higher than the acceptable model fit (RMSEA < .05).

Table 5.3.7: Goodness-of-Fit Indices of the Two CFA Models

Fit Index	One-Factor Model	Two-Factor Model
Unadjusted χ^2	19.49	0.17
Robust S-B χ^2	24.99	0.17
Robust P-value	.00	.89
Degrees of freedom	2.00	1.00
Robust χ^2/df	12.5	0.17
Robust NNFI	0.80	1.01
Robust CFI	0.93	1.00
SRMR	0.05	0.00
Robust RMSEA	0.29	0.00
90% Confidence Interval of RMSEA	(.193~, .392)	(.000~, .102)

5.3.2.3 Comparing the residuals

Hu and Bentler (1995) strongly advise researchers not to overemphasize overall fit indices, and to take account of the residual correlations that result from fitting a model to the data. As Kline (1998) indicates, residual correlations of greater than .10 suggest pockets of relatively poor fit. A review of the standardized residual matrix for the one-factor model informs us that there is residual correlation greater than .10 whereas for the two-factor model all of the residual correlations fall within the ± .10 range (see Table 5.3.8).

Table 5.3.8: Standardized residual matrix

		One-factor model				Two factor model			
		V1	V2	V3	V4	V1	V2	V3	V4
REAL-WORD	V1	.000				.000			
PSEUDOWORD	V2	.000	.000			.000	.000		
READ.VOC	V3	-.004	-.003	.000		-.001	.000	.000	.000
WORD.PIC	V4	-.003	-.003	.162	.000	.000	.000	.000	.000

Based on the standardized residuals, the two-factor model again fared better. There were smaller residuals for the two-factor model as compared to the one-factor model, suggesting that the covariance matrix reconstructed from the two-factor model was closer to the sample covariance matrix.

5.3.2.4 Discriminant validity analysis

One problem that we can see in the two-factor model is that the correlation between the two factors is quite high (r = .87). The premise that two factors represent the same construct implies a correlation of 1.0 between the factors (Anderson & Gerbing, 1988). Discriminant validity was evaluated by constraining the estimated correlation between the two factors fixed to one (see

Figure 5.3.3) and then performing a chi-square difference test on the values obtained for the constrained and the unconstrained model (Joreskog, 1971).

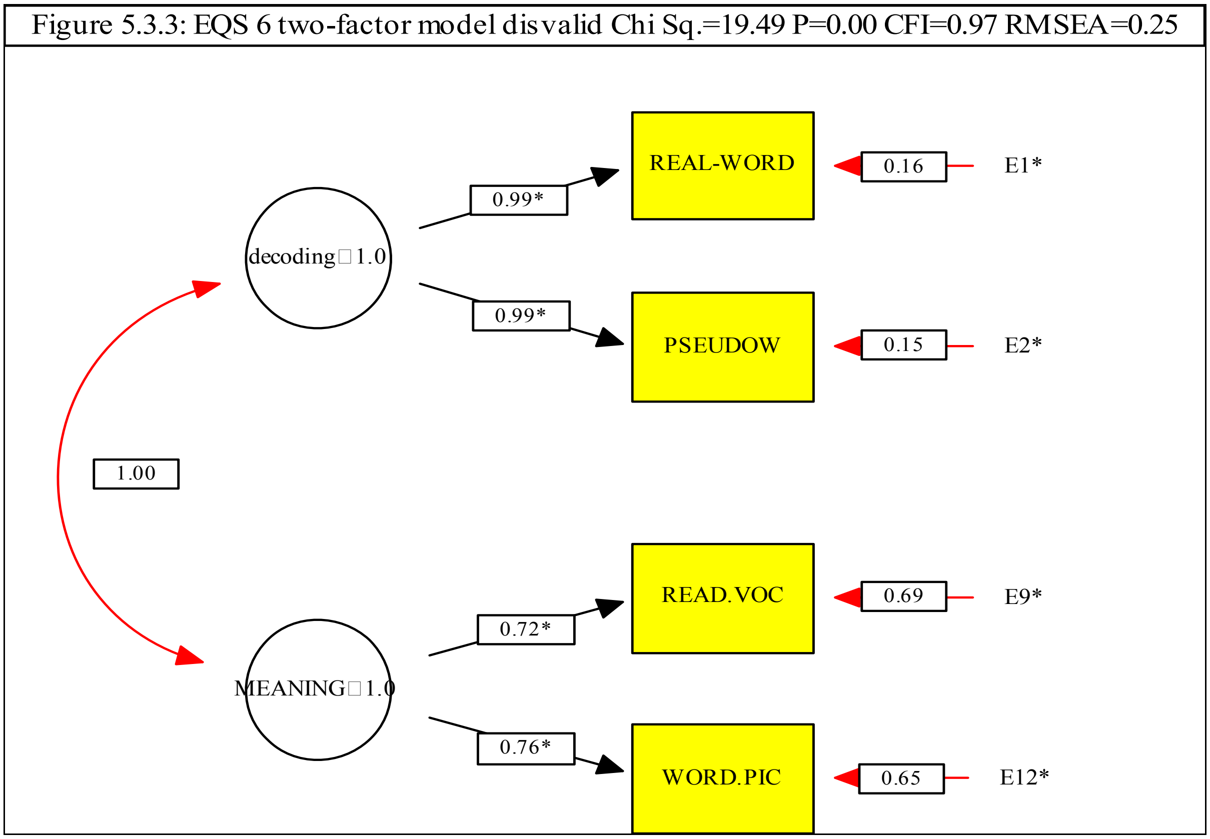

Figure 5.3.3: Discriminant validity CFA model

The chi-square from the constrained two-factor model was the same as for the one-factor model, and they both have the same degrees of freedom. The χ^2 difference test yields 19.22 = (19.49 - 0.17) which is statistically significant ($\chi^2 > 3.84$, df =1, $\alpha = .05$). "A significant lower χ^2 value for the model in which the correlation is not constrained to unity indicates that the traits are not perfectly correlated and the discriminant validity is achieved" (Bagozzi & Phillips, 1982, p. 476).

Thus, the two-factor model was retained for subsequent analysis, providing initial evidence that decoding and meaning identification tasks did not measure the same underlying construct in the current sample, but instead measure two distinct yet related constructs, supporting their separation in prediction models of word-reading in Spanish as a second language. Therefore, our first hypothesis is confirmed.

5.4 TESTING THE REMAINING HYPOTHESES THROUGH STRUCTURAL EQUATION MODELING

In order to test the next three hypotheses, a hybrid SEM was created. Results are presented in two stages—measurement and structure. This sequence allows researchers to ensure that constructs have adequate validity and reliability before drawing conclusions on hypothesized relationships (Bollen, 1989).

5.4.1 The initial measurement model

The measurement model of this study includes five latent variables with eight observed variables. The latent variables meaning identification, PA, and OLP have two indicators. The variables decoding and sentence comprehension have only one indicator.

With single indicator latent variables, the error variance must be set to one value or that portion of the model will be underidentified (Anderson & Gerbing, 1988). The common choices are zero, which assumes that the variable is perfectly reliable and valid, or 1 - the variable's reliability x the observed variable variance (Keith, 1999). The latter approach was chosen. The error variance for pseudoword decoding was estimated at 6.84 {6.84= [(1- r) x (variance of decoding)] = .08 x 85.504}. The error variance for sentence comprehension was estimated at 1.24 (.08 x 15.490).

Before testing for a significant relationship in the structural model, one must demonstrate that the measurement model has a satisfactory level of validity and reliability (Fornell & Larcker, 1981). As in the previous section, the values for Cronbach alpha, construct reliability, and average variance extracted were calculated for all the two-indicator latent variables. The alpha coefficients for all the constructs are in excess of .70 and thus acceptable (Nunnally, 1978). All two-indicator variables reported a composite reliability score above .70 and an AVE above .50 (see Table 5.4.1).

Table 5.4.1: Coefficient Alpha, Construct Reliability and Variance Extracted Estimates for the Measurement Model.

	Coefficient Alpha	Construct Reliability	Average Variance Extracted
PA	.71	.71	.55
Meaning	.83	.83	.71
OLP	.82	.78	.69

Table 5.4.2 presents the matrix summary of the data generated by EQS.

For identification of the measurement model, the variance of the factor was set to one. Anderson and Gerbing (1988) recommend fixing the variance of the factors to one, as this allows the researcher to test the significance of each parameter coefficient.

Table 5.4.2: Matrix Summary of the Data (Covariance Matrix: N=140)

	1	2	3	4	5	6	7	8
1.PSEUDOW	85.504							
2.IN.SY.PA	15.519	14.306						
3.BLENDING	20.590	9.267	19.659					
4.LIST.COM	8.628	4.015	4.144	7.096				
5.SENTENCE	29.541	7.305	8.922	6.450	15.490			
6.ORAL.VOC	55.810	24.875	3.381	30.499	40.758	272.836		
7.READ.VOC	160.550	39.840	53.964	42.778	80.885	290.025	598.871	
8.WORD.PIC	39.315	8.551	11.508	8.534	17.010	53.067	98.460	32.233

The full five-factor model solution, complete with standardized parameter estimates, is depicted in Figure 5.4.1.

The results of the goodness of fit on the measurement model are shown in Table 5.4.3. A small S-B Scaled χ^2 [χ^2 (12) = 16,01, p= .19] suggests that the χ^2 is non-significant. A non-significant χ^2 implies that the implied theoretical model significantly reproduces the sample variance-covariance relationships in the matrix (Schumacker & Lomax, 2004). A RMSEA below the .05 criterion for a good fit, and a CFI value greater than the recommended criterion value of .95 (CFI= .995), indicate an appropriate model fit. However, the correlation between the two latent constructs, sentence comprehension and meaning identification, was too high (r = .99). Estimated correlations about latent constructs that are too high suggest a lack of discriminant validity (Kline, 1998). A test to evaluate discriminant validity was employed.

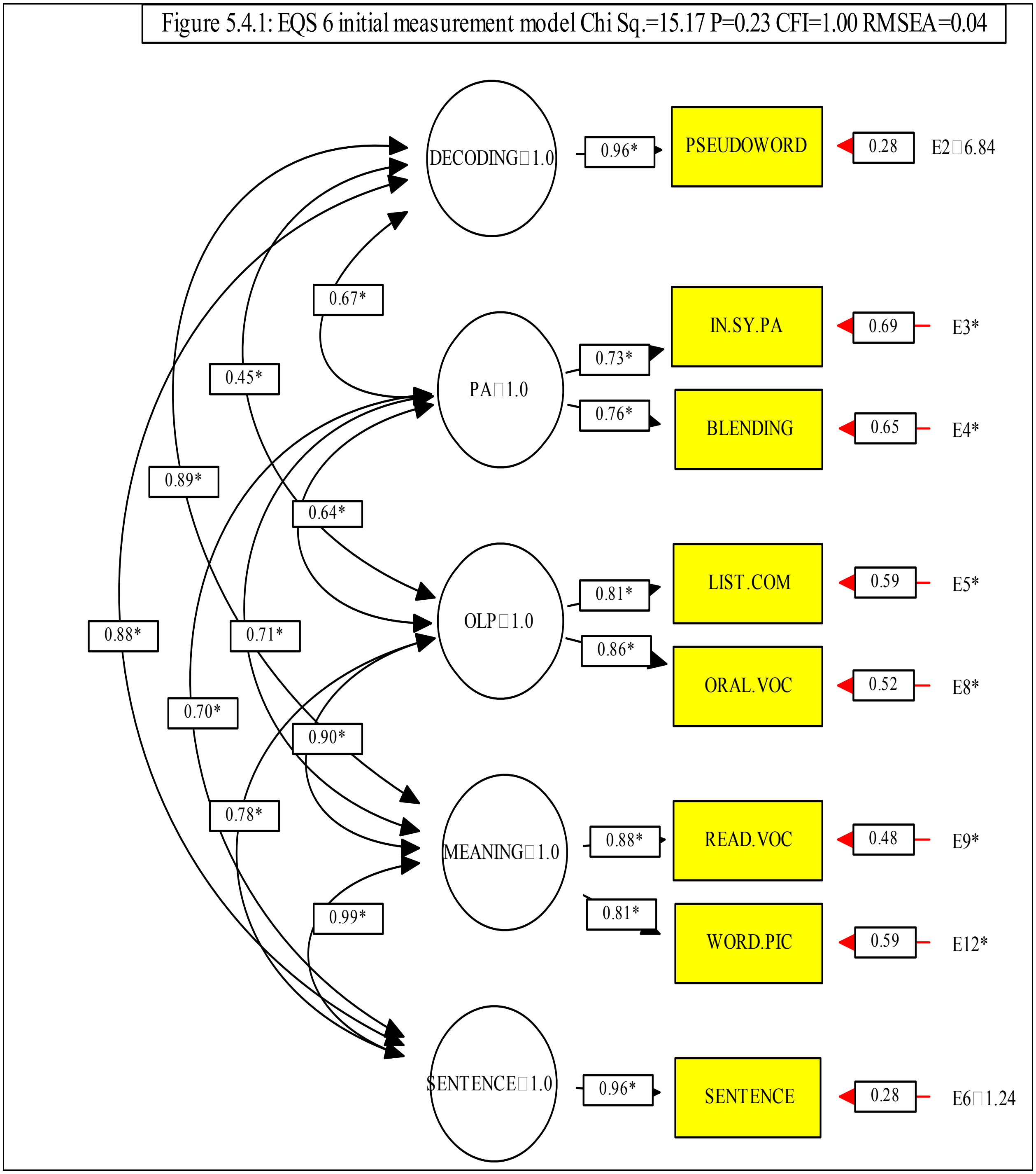

Figure 5.4.1: Initial Measurement Model

5.4.2 Testing discriminant validity

As in our first hypothesis, discriminant validity for two estimated constructs was assessed by constraining the estimated correlation parameters between the two constructs to one and then performing a chi-square test on the values obtained for the constrained and the unconstrained models. A significant lower χ^2 value for the model in which the trait correlation is not constrained to unity will indicate that the traits are not perfectly correlated and that discriminant validity is achieved (Anderson & Gerbing, 1988).

A new measurement model (see Figure 5.4.2) was created with the correlation between Sentence Comprehension and Meaning Identification set to one. The χ^2 difference test equals .11= (15.17- 15.28), which with a single degree of freedom (13-12) is not significant, indicating that the correlation between the two latent variables is not different from 1.

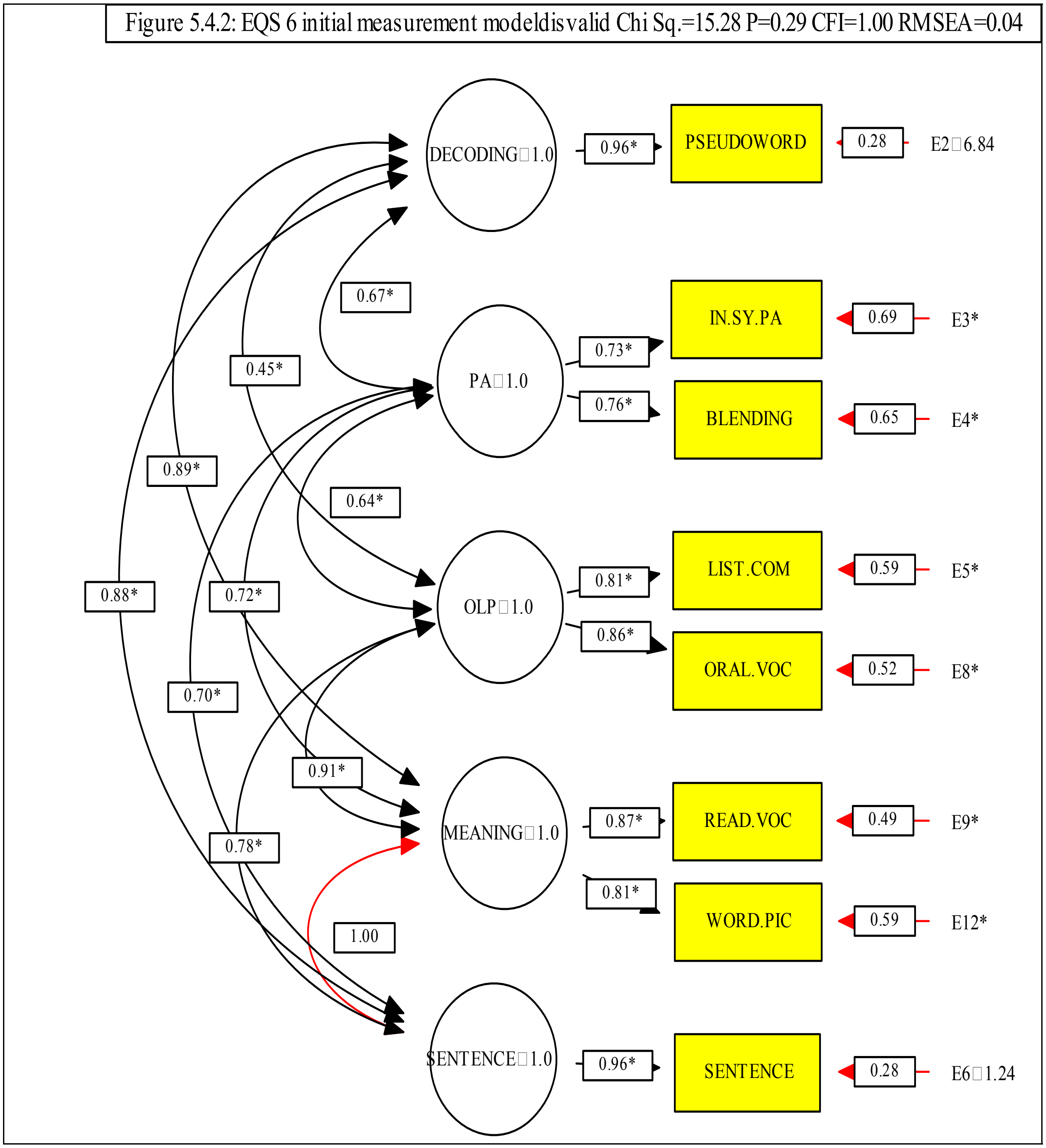

Figure 5.4.2: Discriminant validity for the measurement model

5.4.3 Analysis employing the Word/Picture Matching variable as a single indicator of the latent variable Meaning Identification

As there was no discriminant validity for the latent variables: meaning identification and sentence comprehension, it was necessary to transform the two-indicator latent variable, meaning identification, into a single indicator latent variable. In order not to disregard any of the meaning identification latent variables, two SEM analyses are displayed, one employing word-picture matching and another one employing reading vocabulary (picture-word matching) as single indicator latent variables. Both models revealed the same results. First, a measurement model was created with word-picture matching as a single indicator latent variable (see Figure 5.4.3).

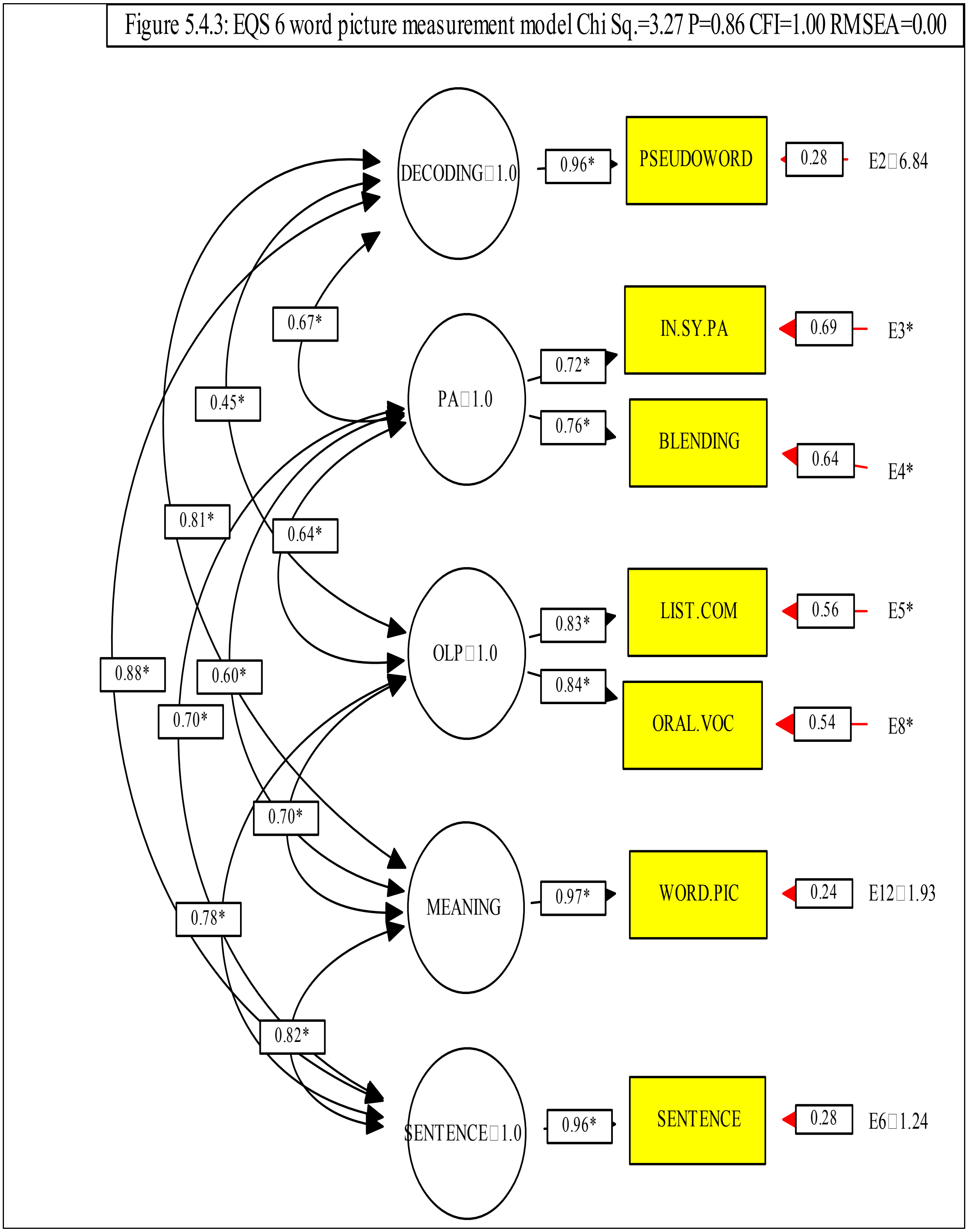

Figure 5.4.3: Word/ Picture Measurement model using Word/Picture Matching.

The factor loading was constrained to 1 and the error variance for the observed variable word-picture matching was estimated at 1.93 {1.93= [(1- r)x (variance of decoding)] = .06 x 32.23}.

Table 5.4.3 compares modified constructs and goodness of fit results for the initial and newly identified measurement model. As predicted, the fit indices became much better with this modification.

Table 5.4.3: Goodness-of-Fit Results for the Initial and Word/Picture Measurement Model

Specification of models	χ^2 (df)	S-B χ^2	NNFI	RMSEA	CFI	Parameters
Initial measurement model	χ^2 (12) = 15.17 p = .19	χ^2(12)=16.01 p = 1.33	0.98	0.05	0.98	All significant
Measurement model with word-picture Matching	χ^2(7) = 3.27 p = .86	χ^2(7) = 3.27 p = .86	1.00	0.00	1.00	All significant

In reviewing the model fit criteria for the word-picture measurement model, we can see that most of the fit-indices are consistent in their reflection of a good fitting model. The χ^2 was non-significant, meaning that the implied covariance matrix does not differ from the actual matrix. A RMSEA below .05 suggests a close fit of the model in relation to the degrees of freedom (Browne & Cudeck, 1993).

The Wald test assesses whether fit may be improved by imposing constraints, whereas the Lagrange test assesses whether fit may be improved by relaxing constraints (Schumacker & Lomax, 2004). The Wald test and the Lagrange test suggested no modifications to the models. The largest standardized residual for the word-picture measurement model is -.050, suggesting that there was very little misfit related to the variables in the models.

The correlation between decoding and sentence comprehension was also pretty high (r = .88). A new discriminant validity test was employed by constraining the correlation between decoding and sentence comprehension to 1. There was an excessive increase in the χ^2 value, (χ^2= 72,40), indicating that the correlation between the two factors is necessarily less than 1.0 and the variances between the two factors are not identical.

Therefore, within the word-picture measurement model, all of the measured variables were significant indicators of their respective latent variables, and no modifications of the measurement model were needed since all of the fit indexes meet the criteria for good fit.

5.4.3.1 Testing the hypothesized Structural Equation Modeling using the Word/ Picture matching variable

The measurement model identified in the previous analyses served as the basis for the SEM model. Decoding, Meaning Identification and OLP latent variables were presumed to have direct effects on the latent variable Sentence Comprehension. It was also predicted that PA skills would directly influence Decoding skills and, finally, the model proposed that Decoding and OLP would have a direct effect on Meaning Identification. The set of relations we have described is illustrated in Figure 5.4.4

The fit statistics indicate that the hypothesized structural model achieves acceptable fit [χ^2 (10, N=140) = 7,96; p = .62; S-B χ^2 = 8.13, CFI = 1.000; NNFI = .986; SRMR = 0.02; RMSEA = .000]. The robust chi square is statistically nonsignificant, indicating a good fit to the data, and the CFI and NNFI fit indices are above the cutoff values. The RMSEA is below the .05 cutoff value that is normally taken to indicate a good model fit.

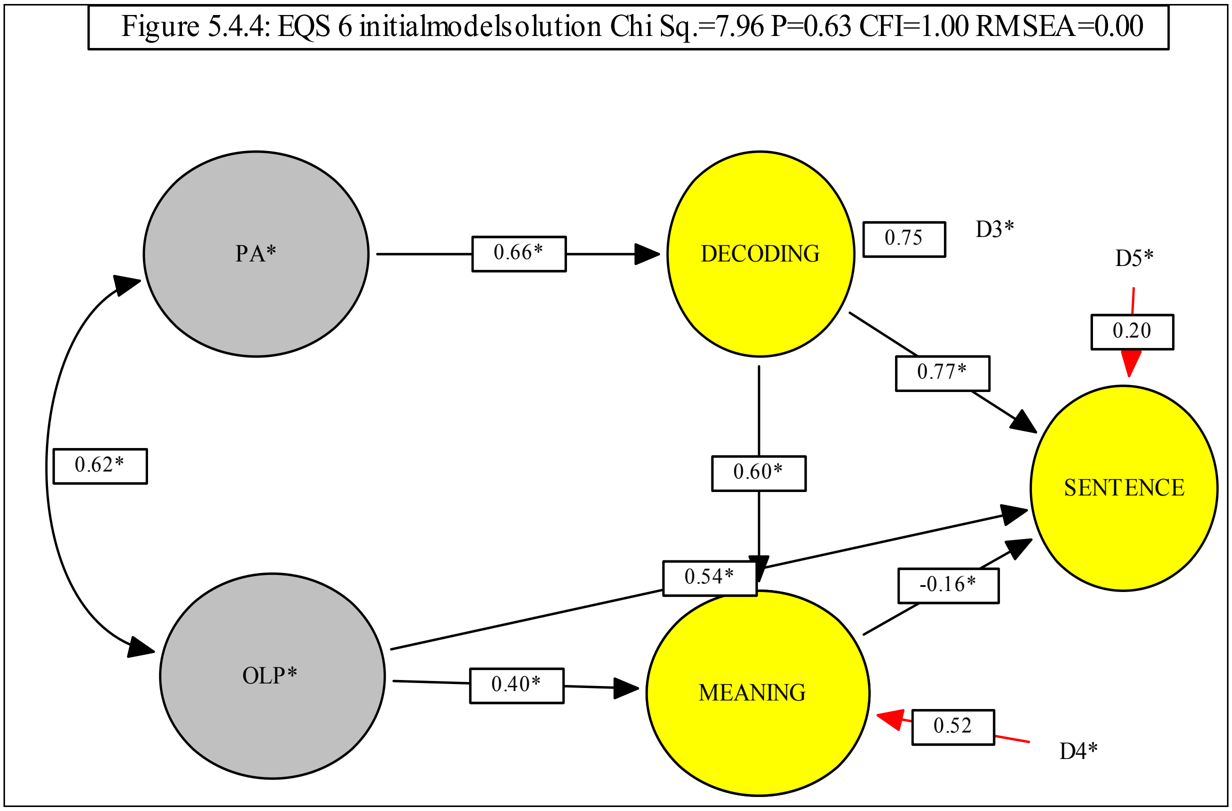

Figure 5.4.4: Results of the hypothesized Structural Equation Model

5.4.3.2 Evaluating parameter estimates of the hypothesized model

Given a good fit, the next step is analyzing the information of the parameter estimates. Because the significance of parameter estimates is different from testing overall model fit, model evaluation must necessarily focus on the overall model fit and the significance of the specified paths included in the model (Kunnan, 1998).

Table 5.4.4: Construct Equations and Test Statistic for the Initial Model

ENDOGENOUS FACTORS	PA F1	OLP F2		Decoding F3	Meaning F4	Disturbance
Decoding =F3=	1.750*F1					+ 1.000 D3
	.282					
	6.204@					
	(.275)					
	(6.371@					
Meaning =F4=		.164*F2	+	.384*F3		+ 1.000 D4
		.026		.037		
		6.250@		10.456@		
		(.028)		(.044)		
		(5.979@		(8.687@		
Sentence =F5=		.150*F2	+	.338*F3	- .133*F4	+ 1.000 D5
		.023		.038	.082	
		6.538@		8.835@	**-1.627**	
		(.023)		(.037)	(.086)	
		(6.435@		(9.005@	**(-1.542)**	

Note: The first number is the unstandardized parameter estimate, followed by the standard of error and the z statistics. Test statistics significant at the 5% level are marked with @. Z statistics based on robust standard errors are in parentheses.

Each unstandardized coefficient has a standard error below it which allows the significance of each parameter to be estimated. The z statistics displayed in the third row are derived by dividing the parameter estimate by the standard of error and provide an indication of whether an estimate is significantly different from zero. Based on the alpha level of .05, a test statistic greater than ± 1.96 is statistically significant (Byrne, 1994). As can be seen in Table 5.4.4, all of the estimates are statistically significant except for the parameter from Meaning (F4) to Sentence (F5).

5.4.3.3 Post hoc model modification

The Wald test provides information as to whether sets of parameters that were estimated (free parameters) could be set to zero without substantial decrease in model fit (Bentler, 1995). Results of the Wald test suggested that the path from the latent variable Meaning Identification to Sentence Comprehension should be removed from the model.

Another model was created by trimming this path; Figure 5.4.5 shows the results and the standardized coefficients.

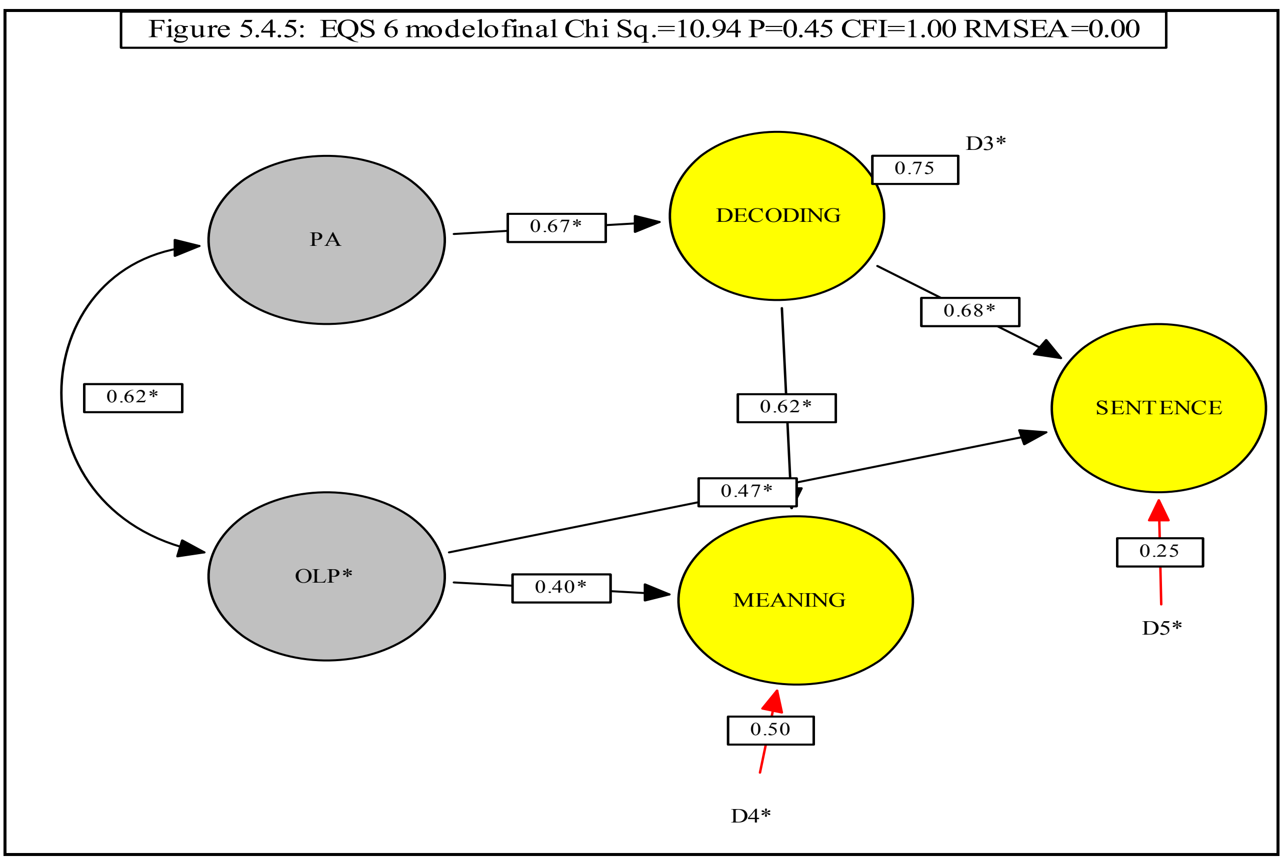

Figure 5.4.5: Final Model Diagram and Standardized Parameter Estimates

The removal of this path did not significantly decrease the fit of the model. The χ^2 difference statistic here equals 2.98 (10.94-7.96) which with a single degree of freedom (11-10) is not significant at the .05 level. A non-significant value of the χ^2 indicates that the overall fits of the two models is comparable and that the model has not been simplified too much (Kline, 1998).

The resulting model fits the data well. Results from the fit indices yielded a R-NNFI of .99, a R-CFI of 1.00, and a R-RMSEA of .010. The Wald test and the LM test inform us that there are no conceptually meaningful paths that could be added to the model in Figure 5.4.5 that could be statistically significant, and no conceptually meaningful paths that could be removed from the model without worsening fit.

5.4.3.4 Evaluating parameter estimates of the new model

The summary of parameter statistics and fit indices is presented in Table 5.4.5. As expected, all the parameter estimates are statistically significant. A statistically significant path coefficient indicates that, for every unit increase in the latent independent construct, there is a correspondent increase in the latent dependent construct of approximately the value of the path coefficient (Maruyama, 1998).

Table 5.4.5: Construct Equations and Test Statistic for the Word/Picture Model

ENDOGENOUS FACTORS	PA F1	OLP F2		Decoding F3	Meaning F4	Disturbance
Decoding =F3=	1.760*F1					+ 1.000 D3
	.281					
	6.263@					
	(.273)					
	(6.434@)					
Meaning =F4=		.156*F2	+	.382*F3		+ 1.000 D4
		.026		.038		
		5.957@		10.075@		
		(.027)		(.045)		
		(5.783@)		(8.575@)		
Sentence =F5=		.124*F2	+	.285*F3		+ 1.000 D5
		.015		.021		
		8.957@		13.899@		
		(.027)		(.018)		
		(5.783@)		(15.561@)		

Note: The first number is the unstandardized parameter estimate, followed by the standard of error and the z statistics. Test statistics significant at the 5% level are marked with @. Z statistics based on robust standard errors are in parentheses.

5.4.3.5 Residual analysis of the word-picture matching final model

After examining the parameter estimates and overall model fit, a more detailed analysis of model fit was constructed by examining the standardized residual matrix which results from fitting the model to the data. A model which describes the data well has evenly distributed residuals, and large values indicate the misspecification of specific parameters. In general, residuals $\leq .10$ indicate a model that is only marginally misspecified (Hu & Bentler, 1995). A review of the frequency of the distributions shows that 100% of the residual values fall within an acceptable range of ≤ .10, showing that the model is properly specified.

Table 5.4.6: Standardized Residuals of the Word/Picture Matching Final Model

	PSEUDOW V2	IN.SY.PA V3	BLENDING V4	LIST.COM V5	SENTENCE V6	ORAL.V. V8	WORD.PIC V12
PSEUDOW V2	-.004						
IN.SY.PA V3	-.014	.000					
BLENDING V4	.017	.010	.000				
LIST.COM V5	.017	.026	-.045	.000			
SENTENCE V6	.015	-.014	-.024	.022	.012		
ORAL.VOC V8	.025	.018	.025	-.017	.021	.000	
WORD.PIC V12	.019	-.059	-.028	.035	-.009	.025	.010

5.4.4 Analysis employing the Reading vocabulary variable as a single indicator of the latent variable Meaning Identification

Section 5.4.3 presents the analysis employing the variable word-picture matching. This section displays the evaluation of the measurement and SEM models employing the variable reading vocabulary as a single indicator latent variable. The error variance for the observed variable reading vocabulary was estimated at 29.94 {29.94=[(1-r)x (variance of reading-vocabulary)]=.05 x 598.87}.

5.4.4.1 Discriminant validity analysis

Due to the significant correlation between reading vocabulary and sentence comprehension (r = .84), a discriminant validity test was assessed by constraining the correlation parameters to one.

There was a significant lower χ^2 value for the unconstrained model 77.11 = (82.36- 5.25), indicating that discriminant validity is achieved and that the reading vocabulary variable can be employed for further analysis.

5.4.4.2 Evaluating the Reading Vocabulary measurement model

As in the analysis with word-picture matching, a two-step approach was used to find a good model. The first step was to test the measurement model, which specifies how the latent variables are measured in terms of the observed variables. The results show a good fitting model (see Table 5.4.9 and Figure 5.4.6).

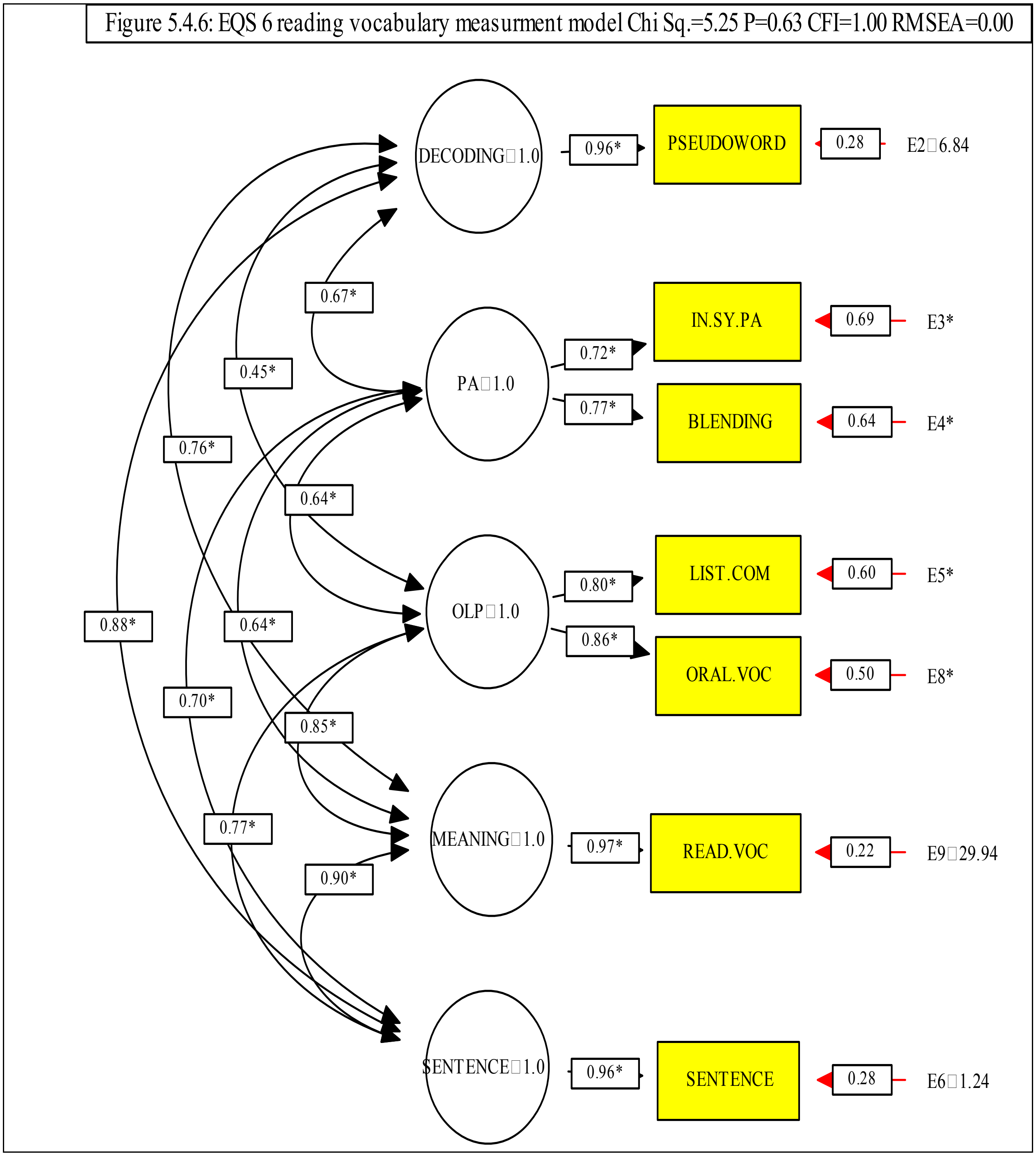

Figure 5.4.6 Measurement model using reading vocabulary as a single indicator

5.4.4.3 Structural Equation Model with the reading vocabulary variable

The next step was to test the structural equation model for the latent variables. The same paths were drawn as in the word-picture matching model. Decoding, meaning identification and OLP latent variables would have direct effect on sentence comprehension. PA skills would directly influence decoding skills and decoding and OLP would have a direct effect on meaning identification. Figure 5.4.7 illustrates the structural equation model with standardized parameter estimates.

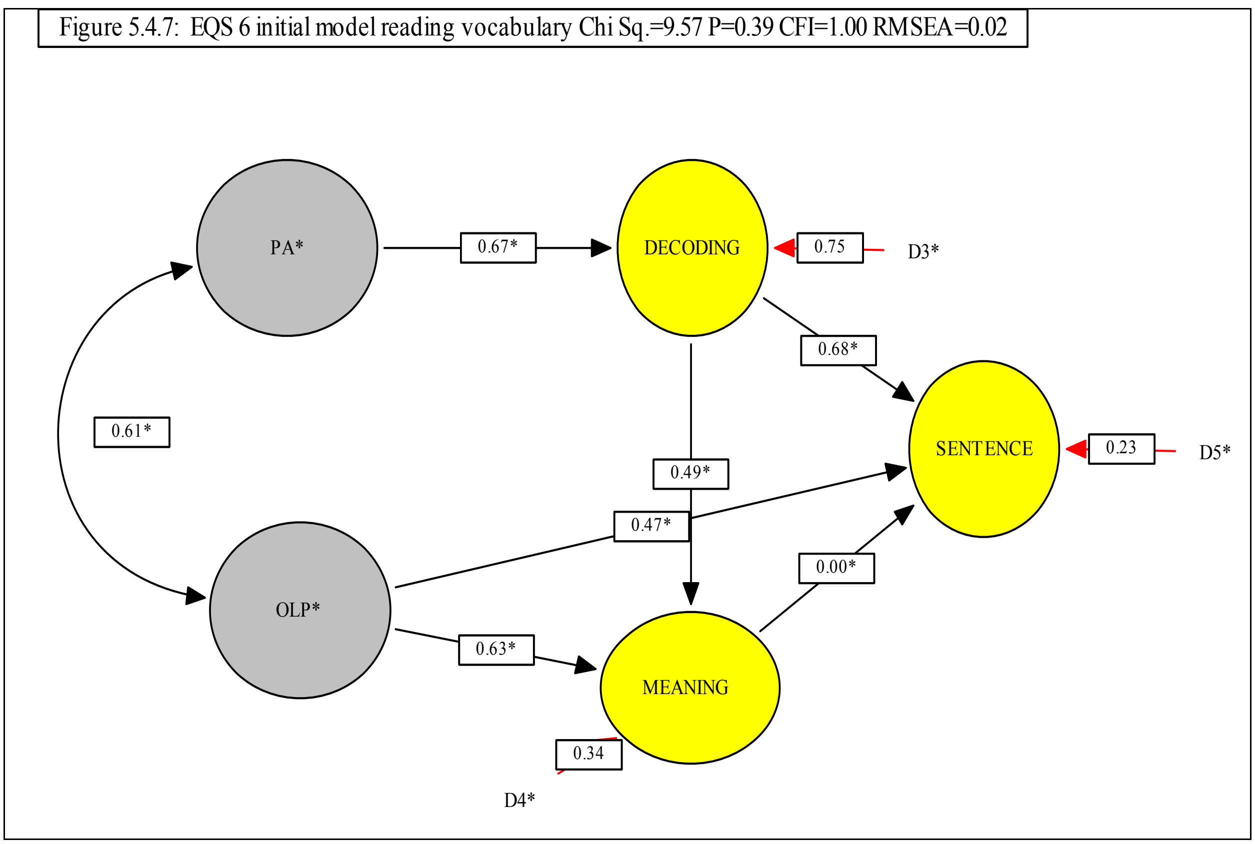

Figure 5.4.7 Initial SEM model using reading-vocabulary

The fit statistics indicate an appropriate fit [χ^2 (10, N=140) = 9.57; p= .48; SB χ^2 = 9.97; CFI= 1.00; NNFI= 1.00; Std. RMR = .023; RMSEA= 0.00]. However, as it happened in the word-picture model, the path from meaning identification to sentence comprehension was not significant (see Table 5.4.7).

Table 5.4.7: Construct equations of the reading vocabulary model

ENDOGENOUS FACTORS	PA F1	OLP F2	Decoding F3	Meaning F4	Disturbance
F3 =F3 =	1.747*F1				+ 1.000 D3
	.279				
	6.260@				
	(.269)				
	(6.499@				
F4 =F4 =		+ 1.031*F2	1.301*F3		+ 1.000 D4
		.104	.138		
		9.956@	9.418@		
		(.112)	(.131)		
		(9.246@	(9.940@		
F5 =F5 =		.122*F2	.288*F3	+ .000*F4	+ 1.000 D5
		.038	.043	.030	
		3.228@	6.639@	**.003**	
		(.038)	(.042)	(.029)	
		(3.190@	(6.774@	**(.003)**	

Note: The first number is the unstandardized parameter estimate, followed by the standard of error and the z statistics. Test statistics significant at the 5% level are marked with @. Z statistics based on robust standard errors are in parentheses.

A new model was created by trimming the non-significant path (see Figure 5.4.8).

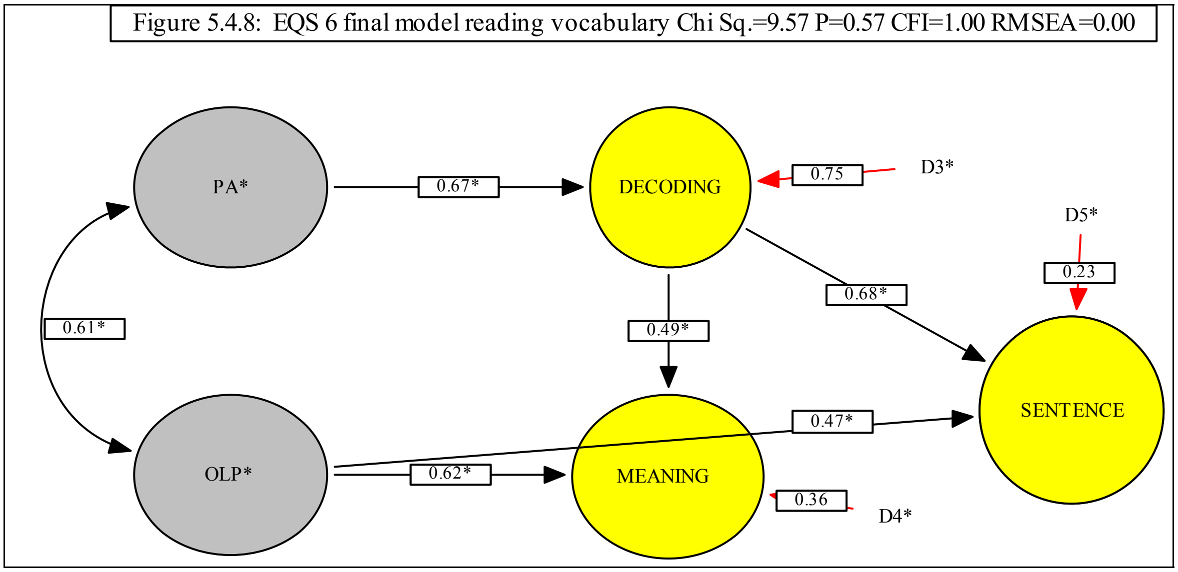

Figure 5.4.8. Final reading-vocabulary model

All paths in the model are significant at the p< .05 level and were in the hypothesized direction. There was no significant difference in the χ^2 by trimming this path, indicating that the model has not been simplified too much.

A review of the residual matrix indicates that all the residual values fall within the range of ≤ .10, showing that the models is properly specified (Hu & Bentler, 1995).

Table 5.4.8: Standardized residuals of the final SEM model using Reading Vocabulary

	PSEUDOW V2	IN.SY.PA V3	BLENDING V4	LIST.COM V5	SENTENCE V6	ORAL.V. V8	READ.VOC V12
PSEUDOW V2	-.002						
IN.SY.PA V3	-.010	.000					
BLENDING V4	.014	.011	.000				
LIST.COM V5	.034	.048	-.027	.000			
SENTENCE V6	.013	-.010	-.028	.040	.015		
ORAL.VOC V8	.024	.020	.021	-.012	.006	.000	
READ.VOC V12	.019	-.056	-.026	.010	-.015	.021	.014

5.4.5 Model comparison between the two Meaning identification variables

The alternative model, using reading-vocabulary as a single indicator latent variable, was structurally the same as the word-picture matching. The relations between of OLP, decoding and meaning were kept structurally the same in each model. Results of the comparisons made among the above-mentioned six models are presented in Table 5.4.9.

Table 5.4.9: Goodness-of-Fit Indicators for the Six Models Tested

Specification of models	χ^2 (df)	S-B χ^2	NNFI	CFI	RMSEA	Parameters
Initial measurement model	χ^2 (12) = 15.17 p = .19	χ^2 (12) = 16.01 p = 1.33	0.98	0.98	0.05	All significant
Measurement model with word-picture matching	²(7) = 3.27 p = .86	χ^2(7) = 3.27 p = .86	1.00	1.00	0.00	All significant
Measurement model with reading vocabulary	χ^2(7) = 5.25 p = .63	χ^2(7) = 5.53 p = .59	1.08	1.00	0.00	All significant
Initial SEM model with word-picture matching	χ^2(10) = 7.96 p = .63	χ^2(10) = 8.13 p = .61	1.00	1.00	0.00	Meaning→ sentence ns. (-1.6)
Initial SEM model with reading vocabulary	χ^2(10) = 9.57 p = .48	χ^2(7) = 9.98 p = .44	1.00	1.00	0.00	Meaning→ sentence ns. (0.00)
Final SEM model with word-picture matching	χ^2(11) = 10.94 p = .45	χ^2(11) = 11.14 p = .43	1.00	1.00	0.00	All significant
Final SEM model with reading vocabulary	χ^2(11) = 9.57 p = .57	χ^2(11) = 9.99 p = .53	1.04	1.00	0.00	All significant

5.4.6 Analysis of the Squared Multiple Correlation

Squared multiple correlations indicate how much variance is accounted for in the overall model (Schumacker & Lomax, 2004).

As shown in table 5.4.10, there are no significant differences between the two models when we compare the amount of variance explained. The only clear difference is in the prediction of Meaning Identification skills. In the model with the reading vocabulary variable, OLP and decoding skills account for .88 % of the variance, whereas in the word-picture matching model, OLP and decoding account for 75% of the variance.

Table 5.4.10: Standard Solution of the Final Models

	SOLUTION FOR THE WORD. PICTURE MATCHING MODEL		**SOLUTION FOR THE READING VOCABULARY MODEL**	
	FACTOR LOADINGS	R-SQUARED	FACTOR LOADINGS	R-SQUARED
PSEUDOW	.959 F3 + .282 E2	.920	.959 F3 + .283 E2	.920
IN.SY.PA	.715*F1 + .699 E3	.511	.709*F1 + .705 E3	.502
BLENDING	.758 F1 + .652 E4	.575	.764 F1 + .646 E4	.583
LIST.COM	.834*F2 + .551 E5	.696	.808*F2 + .589 E5	.654
SENTENCE	.959 F5 + .285 E6	.919	.959 F5 + .285 E6	.919
ORAL.VOC	.851 F2 + .525 E8	.725	.872 F2 + .490 E8	.760
WORD.PIC	.969 F4 + .246 E12	.940		
READ.VOC			.974 F4 + .225 E9	.949
DECODING	.666*F1 + .746 D3	.443	.666*F1 + .746 D3	.444
MEANING	.620*F3 + .400*F2 + .499D4	.751	.488*F3 + .627*F2 + .345 D4	.881
SENTENCE	.677*F3 + .465*F2 + .253D5	.936	.683*F3 + .470*F2 + .227 D5	.948

F1= PA, F2= OLP, F3= Decoding, F4 = Meaning, F5= Sentence.

Sentence Comprehension skills are also significantly influenced by decoding and meaning identification skills, accounting for 94% of the variance. Observed variables blending and intra-syllabic awareness accounted for only 44.5% of the variance in decoding, which means that more than half of the accounted variance is not specified in the model.

In conclusion, whether we choose one variable or the other, the final solutions are basically the same. These SEM models, therefore, can be accepted due to a good model fit and significant parameter estimates. As a consequence, they will be used to examine the proposed hypotheses.

5.4.7 Hypothesis testing based on this model

5.4.7.1 Analysis of the second hypothesis: *L2 oral language proficiency in Spanish does not have a direct effect on decoding skills.*

For this hypothesis, it is predicted that there is no direct path from OLP to decoding. To test this hypothesis, a model with a direct path between OLP and decoding was employed. Figures 5.4.9 and 5.9.10 represent the new models with the path added using both the word-picture matching variable and the reading vocabulary variable.

Similar results were obtained for both models. The χ^2 difference statistics for the word/picture matching model equals .44 (10.94-10.46), which with a single degree of freedom (11-10) is not significant at the .05 level. The χ^2 difference {.51 (9.57-8.96)} for the reading vocabulary model is also non-significant. A non-significant result in model building does not support the retention of the path that was just added (Kline, 1998). The Wald test indicates in both models that the path should be dropped and indicating that the difference is not significant.

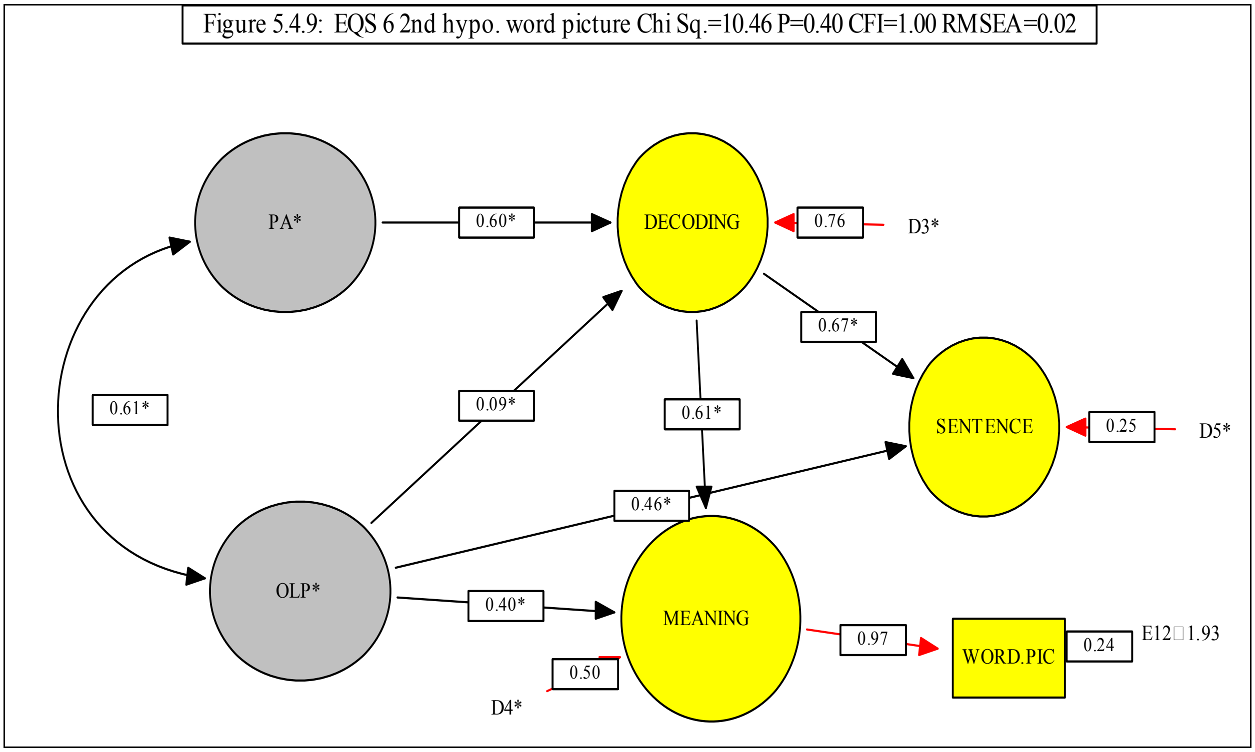

Figure 5.4.9: Second Hypothesis Model using Word-Picture matching variable

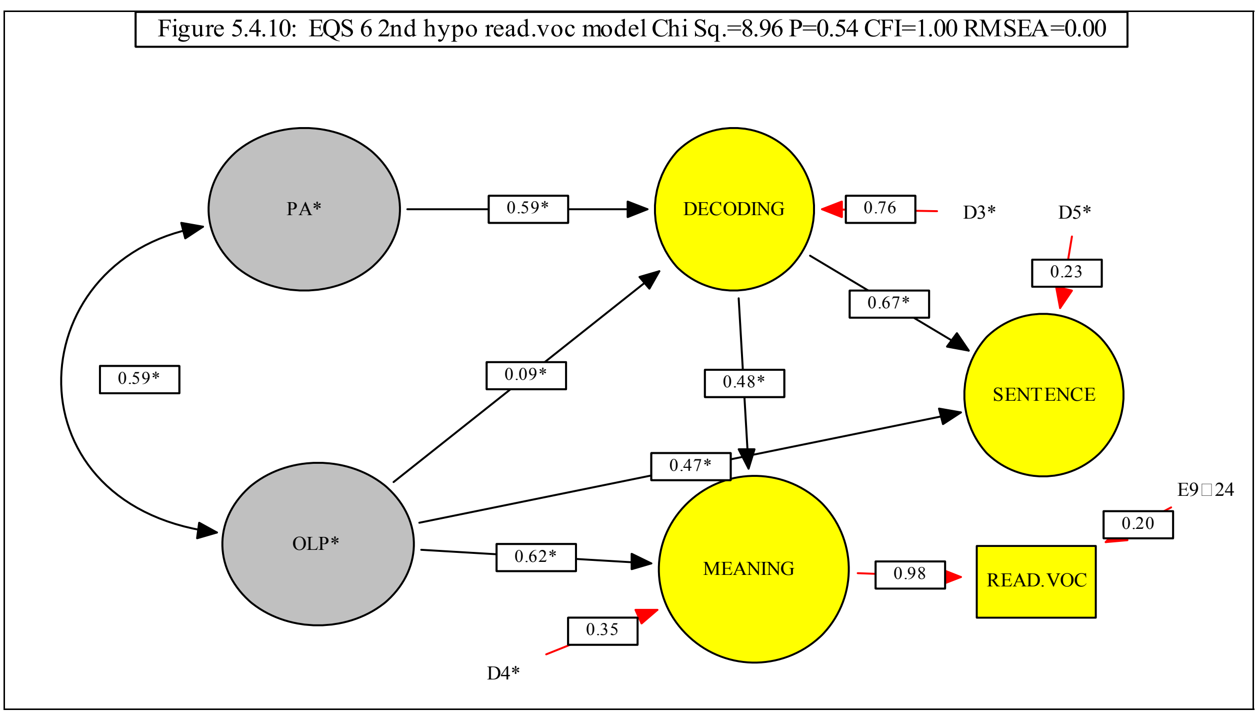

Figure 5.4.10: Second hypothesis model using the Reading- Vocabulary variable

In Table 5.4.11 we can see clearly that OLP (F2) predicting Decoding (F3) is not significant. Therefore our hypothesis is confirmed.

Table 5.4.11: Construct Equations and Test Statistics for the Second Hypothesis Model

ENDOGENOUS FACTORS	PA F1	OLP F2	Decoding F3	Meaning F4	Disturbance
Decoding =F3=	1.563*F1 +	.054*F2			+ 1.000 D3
	.378	.07			
	4.137@	**.707**			
	(.381)	(.079)			
	(4.104@)	**(.690)**			
Meaning =F4=		.156*F2 +	.380*F3		+ 1.000 D4
		.027	.039		
		5.821@	9.781@		
		(.028)	(.046)		
		(5.598@)	(8.272@)		
Sentence =F5=		.284*F2 +	.285*F3		+ 1.000 D5
		.015	.021		
		8.051@	13.455@		
		(.017)	(.020)		
		(7.506@)	(14.534@)		

Note: The first number is the unstandardized parameter estimate, followed by the standard of error and the z statistics. Test statistics significant at the 5% level are marked with @. Z statistics based on robust standard errors are in parentheses.

5.4.7.2 Analysis of the third hypothesis: *L2 Oral Language Proficiency has a direct effect on Word Meaning Identification skills*

For the third hypothesis, it is predicted that there is a direct path from OLP to Meaning Identification. As we can see in Table 5.4.9, the parameter estimate in our model that links F4 (Meaning Identification) and F2 (OLP) is significant; therefore our hypothesis is confirmed.

5.4.7.3 Analysis of the fourth hypothesis: *Sentence Reading Comprehension is affected by Phonological Decoding, Oral Language Proficiency, and Meaning Identification skills*

The fourth hypothesis proposed that OLP, Decoding and Meaning Identification would each have a direct effect on Sentence Reading Comprehension skills. In contradiction to this hypothesis, Meaning Identification did not have a significant direct effect on Sentence Comprehension skills. Decoding and OLP showed large direct effects on Sentence Comprehension, accounting for 94% of the variance.

In SEM, standardized parameter estimates work as standard regression weights reflecting the unique additive contribution of each variable to the endogenous variable (Schumacker & Lomax, 2004). In both of our models, the path from Meaning identification to Sentence Comprehension is not significant, indicating that this path does not reflect any unique additive contribution to the variance of sentence comprehension. This non-significant path can be explained if we look closer at the standard solution in table 5.4.10. OLP and Decoding account for a great deal of variance for the Meaning identification latent variable (88% for the pea-written model and 75% for the word-picture matching model). Therefore, the remaining variance is too small to account for additive unique variance in the Sentence Comprehension. Moreover, OLP and Decoding explain to a great extent (94%) the variance of the Sentence Comprehension and if we allow for some random error in this variable, there is not much variance left to be explained.

If we remember our first measurement model, there was no discriminant validity, indicating that the two constructs, meaning identification and sentence comprehension, can not be said to measure two distinct skills. Given these results, the fourth hypothesis of the present study was partially supported by the data.

6.0 SUMMARY OF THE FINDINGS AND DISCUSSION

The main aim of this dissertation was to determine the extent to which decoding and meaning identification form separate constructs when learning to read in Spanish as a second language. The testing of two alternative Confirmatory Factor Analysis models provides empirical support for our first hypothesis: Accuracy in word decoding skills will not equal accuracy in L2 meaning identification skills. Our hypothesis was confirmed, implying the appropriateness and value of conceptualizing decoding and meaning identification as consisting of two different but related constructs.

The purpose of developing a structural model of reading development was to address the following hypotheses.

H2 L2 oral language proficiency in Spanish does not have a direct effect on L2 decoding skills.

H3 L2 oral language proficiency has a direct effect on L2 word meaning identification skills.

H 4 Sentence reading comprehension is affected by phonological decoding, oral language proficiency, and word meaning identification skills.

The structural model of language and literacy development presented in this study provided a basis for understanding the influence of the oral language domains on decoding and sentence comprehension skills. First, decoding is not directly related to oral language proficiency. Second, meaning identification is accounted for by both decoding and OLP, reinforcing the importance of OLP. Third, Sentence comprehension is significantly influenced by two sources: OLP and decoding. In accordance with our predictions, the first three hypotheses were confirmed and the fourth hypothesis was partially confirmed.

As the data have clearly shown, there was overlap between some variables. An analysis of the task demands and explanations for this overlap will follow. Table 6.0.1 shows each variable employed in the model, as well as the task demand.

Table 6.0.1. Constructs and Task Demands of Each Variable

Construct Assessed	Measure Name	Task demands
Decoding	Pseudoword Decoding	*Phonological decoding* (to map the written pseudoword with a phonological representation)
Decoding	Real-word Decoding	*Phonological decoding* (to map real written words with a phonological representation)
Meaning Identification	Read-Voc. Word-Pic.	*Phonological decoding and semantics* (to map written words with the phonological representation and retrieve the meaning)
Sentence Comprehension	Sent- Comp	*Phonological decoding and semantics* (to retrieve the phonological information from a sentence and interpret it appropriately)
OLP	List. Comp	*Semantics* (to extract meaning from oral sentences)
OLP	Oral- Voc.	*Semantics* (to recognize the phonological representation and extract meaning from oral words)
Phonological awareness	Intra-syllabic	*Metalinguistic skills* (to select the “odd syllable out” on the basis of the initial, medial or final sound)
Phonological Awareness	Blending	*Metalinguistic skills* (to join together the phonemes of the spoken word)

As can be seen from the above table, two constructs were tested through isolated word reading: decoding and meaning identification. Both constructs vary considerably in task demands. Both of them imply the retrieval of the phonological form, however, in the decoding task, the retrieval of meaning from the mental lexicon was unnecessary. As the results confirmed our hypothesis that meaning identification and decoding are different constructs, it seems that Moroccan children do not retrieve the meaning from their mental lexicon when they are asked to decode isolated words.

The extent to which OLP contributes to word reading varies with the demands of the word-reading tasks. Generally speaking, oral vocabulary and listening comprehension, but not phonological awareness, were related to tasks that demanded semantics: meaning identification and sentence comprehension. On the other hand, phonological awareness, but not oral vocabulary and listening comprehension, was related to tasks that demanded only metalinguistic skills and knowledge of grapheme-phoneme correspondences: decoding tasks.

The sentence comprehension task was designed to assess semantic knowledge rather than syntactic knowledge, morphological skills, or working memory (Cuetos et al., 2002). It did not require the subjects to analyze the sentence syntactically in order to interpret the meaning. The retrieval of meaning from the individual words was necessary in order to draw a picture, perform an action or select the proper picture. For example, in the sentence "Draw a moustache on the mouse", knowledge of the word "moustache" is needed in order to understand the sentence. Furthermore, the extremely high correlation between the observed variables, reading vocabulary and sentence comprehension (r= .84), suggests that the task demands were not different. Therefore, we can assert that the reading comprehension task was narrowly constrained by knowledge of word meanings. As there was no syntactic component involved, the only task demand associated with the sentence comprehension task was the retrieval of meaning presented in a brief contextual sentence.

To understand a sentence, the reader has to decode all the words composing the sentence, extract the meaning, and draw links between the words. Sentence comprehension cannot be successful without the identification of all of the words and the retrieval of the meaning. L1 word-reading accuracy must be around 95% for text comprehension to take place. Texts become frustrating when accuracy drops to around 90% (Betts, 1954). In the L2, Hu and Nation (2000) observed that, at the 80% level of vocabulary knowledge, none of the sample apprehended the text meaning. Hu and Nation speculated that adequate comprehension requires 98% for text-word coverage.

Thus, in the sentence-comprehension task used in this dissertation, children needed to decode and understand almost all of the words in the sentence. This measure was very similar to the word-meaning identification measures; the only difference was that one task required reading isolated words while, in the other, the words were in the context of a sentence. Accordingly, the fact that Meaning Identification did not provide any additional variance to Sentence Comprehension could be explained because the two constructs tapped the same demands. This claim is supported by the fact that there was no discriminant validity between the two latent variables; that is, they could belong to the same construct, with the implication being that both measures tested the same skills.

Apart from knowledge of the meaning of the words, isolated sentence-comprehension tasks usually require knowledge about syntactic forms. Sensitivity to story structure, inference-making and comprehension monitoring can be considered as higher-level factors that do not influence sentence comprehension (Perfetti, Landi, & Oakhill, 2005). In the sentence-comprehension task used in our study, most of the sentences either were commands or followed the prototypical syntactic order of subject-verb-complement, e.g. “Pon el lápiz encima del cuaderno” (“Put the pencil on the notebook”). The sentences in this task were too simple to discriminate among levels of syntactic knowledge. Children could grasp the meaning mainly through simple associations of the words that are stored in the mental lexicon, with little risk of ambiguity of meaning.

It is important to emphasize the role of meaning in L2 Spanish isolated-word reading. Meaning Identification was different from Decoding, but it was very similar to Sentence Comprehension. A discussion of each hypothesis and the implication of these findings for theories of reading will follow.

6.1 DISCUSSION OF THE RESULTS FOR THE FIRST HYPOTHESIS

In order to test the hypothesis that accuracy in L2 word decoding skills will not equal accuracy in L2 meaning activation skills, it was predicted that the tasks of real-word decoding, pseudoword decoding, word-picture matching, and reading-vocabulary would load on two factors. The confirmatory factor analysis confirmed our hypothesis. The implication is that this collection of tests is measuring two dependent constructs. Two of these tasks relied on phonological recoding, requiring only the mapping of the orthographical form with the phonological form. The other two tasks, word-picture matching and reading-vocabulary matching, relied on meaning activation, requiring the mapping of the spelling form with the phonological form and the lexical representation. Accordingly, decoding skills in L2 Spanish involves achieving only the phonological representation, whereas meaning identification skills involves achieving the phonological and semantic representations.

Results of this study are in line with previous research that claims that children learning to read in transparent orthographies use the phonological route to read words aloud (Katz & Frost, 1992; Seymour, 1997). Knowledge of grapheme-phoneme correspondences and phonemic assembly is sufficient for decoding any kind of word (Aro, 2006). Signorini (1997) claims that the correct pronunciation is found so easily by means of grapheme-phoneme correspondences, at least with beginning Spanish readers, that the visual route is neglected, to the benefit of the phonological one.

Evidence that translation from print to sound proceeds purely by the phonological route was the high correlation between real word and pseudoword reading ($r = .97$), which means that children use the same procedure to read both real word and pseudoword tasks. The pronunciation of pseudowords is assumed to proceed by sounding out phonemes and blending them together; involvement of the lexicon is supposed to be minimal (Katz & Frost, 1992). This high correlation should lead us to infer that, by and large, these children were not using different strategies in their attempts at word and pseudoword decoding but were attempting to use a phonological strategy and that the involvement of the lexicon was minimal in the two tasks.

High correlations between word and pseudoword reading tasks have also been reported in various studies that dealt with learning to read in L1 in transparent languages: In Turkish, $r = .92$ (Oney & Durgunoglu, 1997); in Persian, $r = .88$ (Gholamain & Geva, 1997); and in Dutch, $r = .90$ (De Jong & Van der Leij, 2002). Similarly high correlations have been reported in studies of children learning to read in English as their L2: $r = .85$ (Geva & Yaghoub Zadeh, 2006) and $r = .87$ (Geva et al., 1993). The high correlations found among children learning to read in L2

English can be explained by the fact that the beginning ESL children were learning to read concurrently in a L1, thus, they applied the same strategies when reading in the L2. Furthermore, ESL children are accustomed to encountering many unknown words, which for them are similar to pseudowords (Geva et al., 1993). They do not yet distinguish between a real word and a pseudoword and, therefore, use the same strategies to decode both.

In view of these high correlations, and according to the results obtained in our study, it seems that children tend to use the phonological route when learning to read in a transparent language and in their L2.

It is also worth noting the fact that both real word and pseudoword tasks were positively skewed and the mean was fairly high (24.91 out of 30 for the real word task and 23.20 for the pseudoword decoding tasks). These high accuracy scores are in line with cross-linguistic studies comparing learning to read in transparent orthographies and in English. While the development of decoding accuracy takes more than one year in English, in the most regular orthographies, such as Finnish, Greek, Turkish, or Spanish, decoding accuracy seems to be close to ceiling after one year of reading instruction (Cossu et al., 1988; Oney & Durgunoglu, 1997; Seymour et al., 2003; Sainz, 2006). As Landerl (2000) noted, no empirical study has shown that English children are better at phonological decoding than children who use a transparent orthography. A transparent orthography, however, does not confer any advantage as far as comprehension is concerned (Oney & Durgunoglu, 1997; Muller & Brady, 2001; Ellis & Hooper, 2001).

This study takes the research in the L2 word recognition area one step further by confirming that the retrieval of the phonological form does not lead immediately to the retrieval of meaning. Theories of lexical access hold the view that the semantic lexicon is not accessed when pseudowords are read, but that it is accessed generally when content words are read (Aaron et al., 1999). Our results demonstrate that reading aloud L2 Spanish real words is similar to reading pseudowords but it is different than reading aloud and retrieving the meaning. Therefore, even if children decode content words appropriately, there is no evidence that the semantic lexicon is accessed.

Following the phonological route, pseudowords and real words were read by using the knowledge of the rules of letter-sound correspondences and blending them together (Goswami, 2006). However, when the tasks involved meaning activation, the results demonstrated that we were dealing with a different construct. As Cook and Bassetti (2005, p. 23) state, "any word can be read aloud without necessarily knowing its meaning".

In L1, decoding automatically leads to meaning activation, *provided that the word is adequately established in memory* (Stanovich, 1993). As Stanovich pointed out, this requirement is crucial. In the L2, as the semantic representation is not adequately established in memory, decoding does not lead automatically to meaning activation. In our third hypothesis, it was confirmed that OLP is necessary to activate the meaning.

A typical second grader reading in his or her native language has acquired the meaning of some 14,000 different lexical items (Nagy & Herman, 1987) and thus understands far more words in the spoken language than he or she can read. In L2, children learning to read do not have the same lexicon as in the L1; L2 children learn the new alphabet and the meaning of new words at the same time as they learn to decode the written form (Geva & Wade-Woolley, 1997). Therefore, many of the words they are able to decode are not represented in their lexicon.

It is important to clarify that in order to establish a word in the mental lexicon, three connections are necessary: the orthographic form, their pronunciation and their meaning (Ehri & Snowling, 2004). By looking at Stanovich's statement, it seems that in the L1, most readers' difficulties concentrate on the connection between the orthographic form and the pronunciation, and the connection with meaning is assumed, as children understand orally more words than they can read. However, in the L2, the connection between the meaning and the phonological form should be considered in detail. Just by reading the word aloud, we can not claim that the reader has established the word in the mental lexicon. This point should be analyzed deeply later when we consider the phases of sight word reading and how reading by memory develops in the L2 (see page 114).

Some studies have shown differences between decoding and comprehension. In a longitudinal study, Verhoeven and Vermeer (2006) compared the decoding efficiency skills and vocabulary reading scores of L1 Dutch children with those of Surinamese and Antillean children and of children coming from Mediterranean countries. They found no difference in the decoding task, but the reading vocabulary scores of Mediterranean children increasingly lagged behind those of the other children, with the delay increasing to two or three years by Grade 6. There was a difference of more than 3,000 words in Grade 3 and a difference of more than 6,000 words in Grade 6. One of the similarities between Verhoeven and Vermeer (2006) study and the present dissertation is that the L2 children coming from Mediterranean countries often came from low socioeconomic backgrounds. Thus, there was a difference in the SES between the L1 Dutch children and the Mediterranean children. However, studies where there was a lack of difference in SES between the two language groups have revealed similar results. Ellis and Hooper (2001) compared children learning to read in Welsh to those learning in English. Notwithstanding the Welsh children's greater accuracy in reading words aloud, it was the English children who showed superior comprehension, demonstrating that the Welsh could read aloud better than they could comprehend. The same results were obtained in a study by Geva and Wade-Woolley

(1997). In their study, L2 children learning to read in Hebrew did not show any difference in decoding with respect to L1 in English, but there was a great difference in comprehension. These studies revealed that L2 students achieve the same levels of decoding accuracy, but they lag behind in comprehension.

In these studies, the assessment of comprehension was different from that of the present study in that, in the other studies, the target word was presented in a brief contextual sentence and children needed more comprehension skills to join the words. In the present study, the target was single-word reading, and a difference was demonstrated between just retrieving the phonological form and retrieving the phonological form with the meaning, implying that there can be a difference between decoding and comprehension with single-word reading.

Another important finding in our study was that there was only one factor solution when we tried Principal Component Analysis but there was a two-factor solution when we tried Confirmatory Factor Analysis. The Principal Component Solution was disregarded because of a possibility that we were dealing with two different but dependent constructs. The fact that Meaning Activation is dependent on Decoding was later confirmed by Structural Equation Modeling, where decoding predicted 62% of the variance. Therefore, the results underline the fact that decoding mediated the establishment of the lexical representation. This dependence is in line with the phonological route, in the sense that the graphemic representation of the word first needs to be converted into a phonological form in order to gain access to its meaning (Coltheart, 1978). This finding has been reported consistently in the L1 learning to read literature (Berent & Perfetti, 1995; Share & Stanovich, 1995). Alegría (1985) suggested that the building of the lexicon depends on the phonological route in L1 Spanish. In line with this idea, Share (1995) states that the *sine qua non* of reading acquisition is phonological recoding, that is, the ability to independently generate pronunciations for novel orthographic strings.

The finding that decoding does not imply meaning activation can be linked to two different theories about learning to read: the Psycholinguistic Grain Size Theory (PGST) and the development of sight-word reading.

First, this finding is in accordance with the Psycholinguistic Grain Size Theory (Goswami, 2006; Ziegler & Goswami, 2005). PGST states that the amount of orthographic information necessary for phonological decoding varies across orthographies depending on their phonological transparency. Children who are learning to read in more orthographically consistent languages are likely to decode words using letter-phoneme conversion because grapheme-phoneme correspondences are relatively consistent. When small grain-size correspondences are inconsistent (e.g., in English), beginning readers have to learn additional correspondences for larger orthographic units, such as syllables, rimes and whole words. To decode the most frequent 3,000 monosyllabic English words at the level of the rime, a child needs to learn the mapping between approximately 600 different orthographic patterns and 400 phonological rimes (Ziegler & Goswami, 2005). Our study is in line with the PGST theory in the sense that there were not many orthographic units to learn to be able to decode only grapheme-phoneme correspondences in L2 Spanish. Moroccan children did not need the support of the orthographic lexicon: by knowing only grapheme-phoneme correspondences, they were able to access the phonological representation. As was the case in our study, the PGST predicts that pseudowords are recognized as accurately as words, indicating that grapheme- phoneme correspondences are used in these processes regardless of the lexicality of the item (Ziegler & Goswami, 2005).

These results are also important for assessing the development of sight-word reading in Spanish as a second language. There are various ways to read words: letter-by-letter decoding or reading directly from memory. The finding that decoding does not imply meaning leads us to question whether the same phases to move from letter-by-letter decoding to sight word reading take place in a L2 as has been stated for the L1.

Learning to read has been viewed as a series of stages or phases. Gough and coworkers (Gough & Hillinger, 1980; Gough & Tunmer, 1986; Gough & Walsh, 1991) proposed three stages: visual association, selective association, and the cipher stage. Ehri (1995, 1998, 2005) gives an alternative, proposing four phases of development: pre-alphabetic, partial alphabetic, fully alphabetic, and consolidated alphabetic. However, these phases or theories might not be generalizable when learning to read in a transparent language (Ehri, 2005). Wimmer et al. (1991) suggested that children learning to read in a more transparent writing system may skip the earliest phases and launch straight into the alphabetic phase. The current consensus is that there is not a pre –alphabetic or a partial alphabetic phase in the acquisition of consistent languages (Goswami, 2006; Porpodas, 2006).

Our results seem to be in accordance with the disappearance of the partial alphabetic phase for transparent languages: Moroccan children seem to follow the full alphabetic phase as they were able to read pseudowords with accuracy similar to that of reading real words. If they were in the partial alphabetic phase, they would have difficulty in decoding pseudowords (Ehri, 2005).

Not much is known about developmental stages in the acquisition of basic reading skills in the L2 (Geva & Wade-Woolley, 1997). This finding can serve to clarify the achievement of the fully alphabetic phase and the development of sight-word reading in the L2. Instead of decoding letter by letter, advanced readers can read a word from memory, what is called reading by sight (Ehri and Snowling, 2004). To be able to read from memory, the phonological, orthographic and semantic representations need to be adequately connected in memory. Ehri (1998, 2002, 2005) indicates that children achieve the fully alphabetic phase by forming all grapho-phonemic connections of the word, not just beginning and end, and this skill should lead them to sight-word reading. In other words, phonology underlies the storage of sight word reading. If we apply Ehri's phase theory to our study, most Moroccan children could be described as fully alphabetic as they could decode accurately all the sounds of the word, blend them, and decode pseudowords. However, these decoding skills might not be enough to be able to read words by sight and store the word in memory as they were not able to form the connection with the lexicon. Ehri (1998, 2005) claims that to secure a word in memory children need merely to read the word aloud four or five times. In reading in Spanish as a second language, this process of simply reading the word aloud a few times might not be sufficient to establish a word in memory. Storing sight-words in memory requires securing grapheme-phoneme connections to pronunciations and meanings of word units in memory (Ehri, 2005). Results of our study indicate that in only reading aloud, the meaning of a word is not activated. If the meaning of the word has not been established, no matter how many times a child reads the word aloud, the word will not be established in memory as no meaning connection is possible. Thus, in the L2, it is likely that the process to establish a word in memory is different than in the L1. It is not only necessary to encounter a word four or five times; it is also necessary that the reader forms the meaning connection, as this connection does not take place automatically as in the L1. As Ehri established, "decoding skill might not be sufficient to move readers to the full phase if it is not practiced as a tool for building up sight vocabulary but is simply applied as a strategy for sounding out the letters in the words” (2005, p. 185).

To sum up, it appears that Moroccan children learning to read in Spanish as a second language need more than repeated reading aloud and forming all the grapho-phonemic connections of a word to be able to read by sight; establishing a connection between the pronunciation and the meaning is crucial to keep the word in memory.

An intriguing finding was observed by Share (2004), who reported that despite high levels of word and pseudoword decoding accuracy, children who learn to read in L1 Hebrew, failed to select the appropriate word spelling until Grade 3. As we have observed with activation of word meaning, in this case, decoding accuracy per se was not sufficient to ensure orthographic learning.

The results underline the fact that reading accuracy, as such, is not a sufficient measure of reading isolated words. In fact, reading problems in L1 transparent languages are reflected in reading speed rather than in reading accuracy (Martens & De Jong, 2006; Porpodas, 1999; Rodrigo & Jiménez, 1999). However, in L2 reading, reading speed might also lack the influence of meaning activation. In a recent study by Geva and Yaghoub-Zadeh (2006), ESL children could read isolated words and text with the same accuracy and speed as L1 children. Similar results of tests of reading accuracy and speed have also been found by Droop and Verhoeven (2003) and by Verhoeven and Vermeer (2006). As has happened in the case of accuracy, it could also be the case that a word or a passage can be decoded into the spoken form efficiently without comprehension taking place. Further research is necessary in this field.

6.2 DISCUSSION OF THE RESULTS FOR THE SECOND HYPOTHESIS

The results of the two alternative SEMs confirmed our hypothesis that OLP does not have a direct effect on decoding skills. The omission of a direct arrow corresponds to a belief that there is no direct cause-effect relation between OLP and phonological decoding, which means that beginning readers do not rely on oral language proficiency for the development of decoding skills.

As stated in our first hypothesis, meaning is not necessarily activated when reading a real word aloud. Accordingly, as the meaning of a word may not be activated, there is also no facilitating effect of vocabulary when achieving the phonological form.

Results of this study are in line with previous research that has shown that even though native and non-native speakers differ on their level of oral language proficiency, they can perform at the same level of accuracy or even better when the task is simply to read words aloud. These results have been consistently reported when the task was accuracy of word decoding in a transparent orthography, both in the L1 with Welsh children (Hanley et al., 2004; Spencer & Hanley, 2003, 2004) and in the L2 with children learning to read in Hebrew and Persian (Geva & Siegel, 2000; Geva & Wade-Woolley, 1997; Gholamain & Geva, 1999). Even when the task was decoding efficiency, Verhoeven and his collegues reported that decoding abilities in an L2 transparent orthography were not explained on the basis of OLP (Verhoeven, 1990; Droop and Verhoeven, 2003; Verhoeven & Vermeer, 2006). It is important to mention that no matter how OLP has been assessed, either by teacher ratings (Gholamain & Geva, 1999; Geva & Siegel, 2000) or by vocabulary and listening comprehension tests (Verhoeven & Vermeer, 2006) the results have always been similar. The explanation for these results is that students learning to read in an L2 transparent orthography need to master only a limited number of consistent and simple decoding skills; even with limited L2 language proficiency, they can acquire decoding skills just by sounding out the grapheme-phoneme rules (Geva & Siegel, 2000; Verhoeven & Vermeer, 2006).

However, these same results have also been found when children were learning to read in an opaque L2 orthography such as English (Chiape, et al., 2002; Geva et al., 1993; Gottardo, 2002; Hutchinson et al., 2003; Lesaux & Siegel, 2003; Lipka et al., 2005; Lindsey et al., 2003; Muter & Diethlen, 2001) or in L2 French (Lefrancois & Armand, 2003). Verhoeven & Vermeer (2006) explain these results in L2 English by the fact that most of these children learning to read in a second language were also learning to read in a native language. Bi-literate children tend to show well-developed metalinguistic skills that promote their word reading skills (Durgunoglu et al., 1993; Geva & Wade-Woolley, 1998; Verhoeven & Aarts, 1998). Shwartz et al. (2005) found that bi-literate children learning to read concurrently in Russian and Hebrew were superior to their monolingual and mono-literate bilingual peers on measures of phonological awareness and word and text decoding.

The present study is also different from the majority of those ESL studies as the children observed here were learning to read in their L2 for the first time; however, the results are similar. Considering that the advantage of being bi-literate was not applicable in this context, the results could be due to the fact that the children were learning to read in a transparent orthography. According to the Psycholinguistic Grain Size Theory, when students learn to read in transparent orthographies, they need to master a small number of orthographic units. Relying heavily on grapheme-phoneme decoding strategies, they can decode syllable by syllable and pronounce any word properly. Therefore, knowledge of the meaning of the word is not necessary to decode the word.

In fact, in our study OLP has an indirect effect on decoding through phonological awareness. This indirect effect of OLP is consistent with L1 English studies that have found significant influence between oral language skills and PA in early elementary school (Goswami, 2001; Lonigan, Burguess, & Anthony, 2000; Muter et al., 2004; Metsala, 1999; Whitehurst & Lonigan, 1998, 2001). However, the relationship between OLP and PA is controversial, with some studies indicating that it was not significant (Durgunoglu et al., 1993; Stanovich et al., 1984; Turner et al., 1988) and other studies reporting a significant correlation (Bowey & Patel, 1988; Carlisle et al., 1999). In our study, the correlation between PA tasks and OLP tasks was moderate but significant (between r = .35 and r = .40). There are two likely explanations for the significant correlations between those tasks. First, the language of instruction was Spanish and, as reported by Carlisle et al. (1999), the language of instruction exerts an influence on the possible correlation between PA and OLP, and, second, the rhyme tasks have been reported to require some knowledge of vocabulary (Metsala, 1999; Chiappe et al., 2002).

In our model phonological awareness predicted only 44% of the variance of decoding skills. This means that PA is predictive of some of the variability in the decoding outcome but not all of it. One reason might be that the rhyming tasks were not the most appropriate. Rhyme ability has been shown to be less important for reading in a transparent orthography than phoneme awareness (Cardoso-Martins, 1995; Wimmer et. al., 1994, Hanley et al., 2004; Spencer, 2004). Durgunoglu et al. (1993) speculated that Spanish –speaking children do not develop an early knowledge of onset-rime units because these might not be as salient in Spanish as they are in English. In Durgunoglu's study, and also in our study, awareness of onset and rime units was in fact difficult for Spanish speaking children, a result which contrasts with a number of phonological awareness studies performed on English speaking samples (Treiman, 1985). Another reason might be that the blending task might not be a key measure for testing PA skills in Spanish as a second language.

6.3 DISCUSSION OF THE RESULTS FOR THE THIRD HYPOTHESIS

The SEM model provided a clear window of how L2 decoding and L2 oral language proficiency contributed to meaning identification. It was predicted that meaning identification would be more in line with the oral language measures than the decoding measure, because both focus on processing of meaning. Accordingly, our third hypothesis was that performance in oral language proficiency would have a direct effect on meaning activation. This prediction was supported by our results.

Because there was no discriminant validity between the latent variables meaning identification and sentence comprehension, two alternative SEM models with a single observed variable had to be created. The results were very clear in the sense that in both models the OLP latent variable accounted for a significant variance in meaning identification.

This finding is not surprising if we consider the results of our first hypothesis: If decoding and meaning identification do not form part of the same construct, then, it should be the case that each construct is based on different underlying skills or abilities. As decoding and OLP account for significant variance in the latent variable meaning identification, we can infer that the extent to which meaning identification departs from the level predicted by decoding is related to oral language proficiency.

This is a significant finding in light of many research studies that have not found support for a connection between OLP and isolated L2 word reading. The results suggest that, depending on the exact nature of the dependent variable, the involvement of oral language proficiency varies. Catts et al. (2006) pointed out that there is inconsistency between the reading outcome in terms of word recognition and that in terms of reading comprehension, as there is emerging evidence that OLP plays a crucial role in the growth of comprehension skills, whereas its impact on decoding skills is less clear. Our findings can help to clarify the role of OLP in word recognition in Spanish as a second language: If the outcome is phonological decoding, there is no involvement of OLP as children do not need the vocabulary to activate the phonological form. On the other hand, if the outcome is meaning activation, children need to have the word stored in their lexicon and, therefore, OLP is significant.

As Jackson and Coltheart state, “at any given moment, a child’s oral language influences and sets limits for the operation of their reading system” (2001, p. 110). Results of our study confirm that OLP can exert an influence on isolated word reading. Vocabulary knowledge and listening comprehension skills allow the creation of mappings between orthographic, phonological, and semantic representations (Nation & Snowling, 1998; Muter et al., 2004). Accordingly, when the outcome tapped into retrieval of the semantic representation, achieving not merely the phonological representation, oral language proficiency played a role in predicting the variance of word reading.

This finding is consistent with the idea that OLP skills exert an influence over isolated word reading skills that is independent of that associated with phonological skills. Nation and Snowling (2004), in a study of English Ll children, reported that both vocabulary and listening comprehension accounted for unique variance when the task required the pronunciation of regular words and exception words, even when the powerful effects of non-word reading were controlled. We can interpret Nation and Snowling's finding as a consequence of the demands of the reading task; when the task involved exception words, there was more involvement of the lexicon. In Spanish, as there are no exception words, OLP does not play a role in the retrieval of pronunciation but it does play a role in the retrieval of meaning.

As a consequence, this finding is in clear disagreement with some of those of Geva, who stated that "word-base reading skills are less dependent on the attainment of well developed oral language skills than discourse processing skills" (2000, p.17). Contrary to Geva's argument, we can claim that even at word-level reading, when the outcome tasks involve meaning activation, children's vocabulary and spoken language comprehension limit how many words he or she can understand.

As we have discussed in our first hypothesis, the tasks of word meaning identification get closer to the idea of sight-word reading as they tap both phonological decoding and meaning activation. Accordingly, in order to develop sight-word reading and get closer to automaticity in Spanish as a second language, children need to do more than assemble or decode pronunciation on the basis of spelling–sound mapping; they need oral language proficiency in order to establish the mapping with the lexicon.

6.4 DISCUSSION OF THE RESULTS FOR THE FOURTH HYPOTHESIS

The SEM model presented in this dissertation shows that sentence reading comprehension is significantly influenced by only two factors: oral language proficiency and phonological decoding, together predicting 98% of the variance. Meaning identification does not provide unique variance in sentence comprehension. Therefore, the results confirmed our hypothesis that OLP and decoding exert a direct effect on sentence comprehension. However, it was not expected that meaning identification would not have a direct effect on the sentence comprehension.

There are several implications in the results of this hypothesis. First, we can claim that beginning L2 Spanish readers rely both on decoding skills as well as on OLP skills in order to retrieve the meaning from simple sentence comprehension tasks, not one to the exclusion of the other. The results of our study reinforce the L1 view that two general elements are equally important to reading comprehension: decoding and oral language proficiency.

Studies employing Structural Equation Models of reading comprehension processes among L2 students have shown similar effects of decoding and OLP on reading comprehension, although the outcome task was text comprehension and not sentence comprehension (Droop & Verhoeven, 1998; 2003; Verhoeven & Vermeer, 2006). Verhoeven (2000), in a study of first and second grade children reported effects on text reading comprehension and factor loadings similar to those in our study: word decoding had an effect of .60, in our study it was .68, and vocabulary knowledge had an effect of .63, in our study it was .47.

SEM studies with monolingual readers have also shown similar effects of vocabulary and decoding on text comprehension (Storch & Whitehurst, 2002; Muter et al., 2004). The paths from vocabulary knowledge and accurate decoding were significant and accounted for variance in reading comprehension ability.

The role of phonological decoding skills as a necessary component of the reading process has been well established irrespective of the language (Adams, 1990). Stanovich (1991) observes that while the reader may have poor comprehension in spite of adequate decoding, the reverse hardly ever occurs, implying that those constructs are not independent. Decoding is a prerequisite for reading comprehension (Share, 1995). If a reader requires considering processing capacity to decode a single word, his processing capacity is less available for higher-order integrated processes (Perfetti & Hogaboam, 1975). Being able to identify words in their printed form is necessary for reading, but of course it is not sufficient. Comprehension is also required (Shankweiler et. al., 1999).

The role of meaning in reading comprehension is unquestionable; the ultimate goal of reading is not to decode isolated words, but to understand what has been read (Nation & Angell, 2006). Reading comprehension involves the extraction of meaning from written language and inability to access word meanings must inevitably affect processing at higher levels (Nation & Snowling, 1998). At the moment a reader encounters a text, the ability to retrieve the meaning of the word is critical: a reader must know at least 90% of the words in a text for comprehension to be effective (Nagy & Scott, 2000). Inferring the meaning of unknown words in a text is possible only if most words are understood and if some approximation to text meaning is achieved.

Apart from the importance of retrieving the meaning of all the words to achieve comprehension, vocabulary knowledge and reading comprehension have been demonstrated to have a reciprocal relationship (Stanovich, Cunningham, & Freeman, 1984). The more children understand the text, the greater the opportunity to learn vocabulary, and increased vocabulary knowledge results in a greater chance that the text is understood.

As for the importance of vocabulary in the L2, second language theorists agree that oral language proficiency appears to be of critical importance for L2 reading comprehension (Carlisle et al., 2000; Carlo et al., 2004; Geva, 2000; Leikin et. al., 2005; Lefrancois & Armand, 2002; Royer & Carlo, 1991).

Those findings revealing the importance of decoding and oral language proficiency in sentence reading comprehension lend support to the Simple View as a viable theory of reading comprehension. According to the Simple View, "Both decoding and linguistic comprehension are necessary for reading success, neither being sufficient by itself" (Hoover & Gough, 1990, p. 128).

The simple view claims that skills in reading comprehension can be characterized as the product of skill in decoding and listening comprehension. To put it differently, a learner's ability to read and understand text can be predicted if you know that learner's ability to decode written words and to understand spoken language. As we have stated above, our study does not contradict the Simple View of Reading; rather, it reinforces the idea that reading comprehension consists of these two main components.

However, findings in our study reveal some differences with respect to the Simple View of Reading. The Simple View claims that there is a progression in the influence of those constructs: in the early school grades, decoding explains the bulk of variability in reading comprehension but, over time, as children become more facile decoders, linguistic comprehension skills tend to predict an increasing proportion of variation in reading comprehension. Accordingly, reading comprehension should be explained mostly by decoding abilities with first and second graders (Gough, Hoover, & Peterson, 1996; Storch & Whitehurst, 2002; Schankweiler et al., 1999) and this relationship changes as the beginning reader gains experience. The beginner who cannot yet identify even the most familiar word in printed form will be unable to comprehend anything on the printed page (Schankweiler et al., 1999).

The high correlation found in our study between decoding and sentence comprehension ($r = .81$) is also noteworthy and demonstrates that decoding and sentence comprehension are closely related constructs among L2 second graders learning to read in Spanish as a second language. However, in contrast to the simple view, the results in our study indicate that sentence-reading comprehension in the early graders is predicted not only by decoding skills but also by oral language proficiency skills.

In both studies, children were learning to read in their L2, but there is a credible explanation for the differences between our results and those of Hoover and Gough's study: the different levels in L2 OLP. The participants in Hoover and Gough's model were at the end of first grade, but while their listening comprehension performance was at the third-level narrative, they were only at the first-level narrative for reading comprehension, demonstrating that most of the decodable words were already in their mental lexicon (Hoover & Gough, 1990). Therefore, among Hoover and Gough's beginning readers, listening comprehension approached 1. In the multiplicative model, reading comprehension is the product of decoding and listening comprehension (RC= D x C). If listening comprehension approaches 1, then reading comprehension equals decoding (RC = D).

By contrast, the learners in our study did not have excellent listening comprehension and receptive vocabulary skills in second grade; therefore, their level of reading comprehension is explained by both decoding and oral language comprehension. In accordance with this explanation, Tunmer and Hoover (1993) observed that, although children develop accurate decoding skills, comprehension will not exceed general language ability.

The latent variable meaning identification did not have an effect on sentence comprehension. This result should be interpreted with caution. It does not mean that word meaning identification skills are not effective predictors of reading performance. It means that in the SEM model employed in this study, meaning identification did not provide any unique variance apart from Decoding and OLP. As both latent variables, meaning identification and sentence comprehension, were highly predicted by the same observed variables, we can claim that the tasks of meaning identification almost coincided to sentence comprehension.

Furthermore, in the original measurement model, there was no discriminant validity between meaning identification and sentence comprehension; that is, they could belong to the same latent construct. As stated above, the measures employed tapped the same reading demands. Although sentence comprehension can be considered a higher-level task (Kintsch & Van Dijk, 1978), in order to understand a sentence, the reader has to decode all the words and retrieve all the meanings of the words (Perfetti et al., 2005). In line with these similarities between these variables, reading researchers have considered these two variables within a single latent factor, incorporating word vocabulary accuracy and reading comprehension tasks (Droop & Verhoeven, 2003; Storch & Whitehurst. 2002).

The fact that there was an overlap between meaning identification and sentence comprehension can be compared to the Simple View of Reading. As we have seen before, the Simple View of Reading states that decoding is very closely intertwined with reading comprehension in the early stages of reading, and that early reading comprehension is primarily a function of word decoding (Hoover & Gough, 1990; Juel, Griffith, & Gough, 1986; Shankweiler et al., 1999; Storch & Whitehurst, 2002). In our study it is not decoding but word meaning identification that was similar to sentence reading comprehension and there was no discriminant validity between those variables. The similarity with the Simple View lies in the fact that in both studies word-level skills are fundamental; as Nation and Angell (2006) state "no amount of grammatical knowledge or sensitivity to context can compensate for inadequate word-level skills" (p. 79). However, the difference can be explained by the level of second language oral proficiency. In Hoover and Gough's study, bilingual children could retrieve the meaning of most of the words in the comprehension task but they had difficulties achieving the phonological form; accordingly, the decoding task was the crucial variable. In our study, children had most difficulties in acquiring the meaning; accordingly, the meaning identification task was the one highly correlated. As Perfetti et al. (2005) stated, "Not knowing the meaning of words in a text is the bottleneck for comprehension" (p. 240).

If we try to apply the Simple View to reading in a second language, we find there is a certain ambiguity in assessing word decoding. The authors' definition of decoding is very clear: "the ability to rapidly derive a representation from printed lexicon that allows access to appropriate entry in the mental lexicon, and thus, the retrieval of the semantic information at the word level" (Hoover & Gough, 1990, p.130). However, the tasks defined by the authors are not as clear.

> An adequate measure of decoding skill must tap this ability to access the mental lexicon for arbitrary printed words (e.g., by assessing the ability to pronounce isolated real words). However, for beginning readers, who must acquire a phonological based system, an adequate decoding measure must assess skill in deriving appropriate phonological-based representation of novel letters strings (e.g., by assessing the ability to pronounce isolated pseudowords (p.131).

Hoover and Gough probably made these claims because when learning to read in the L1, the level of vocabulary and listening comprehension has already been developed and children's difficulties lie in obtaining a phonological representation. However, in L2, listening comprehension develops simultaneously to L2 reading (Droop & Verhoeven, 2003). As we have demonstrated in our first hypothesis, acquiring a phonologically based system did not imply the ability to access the mental lexicon for arbitrary printed words. Therefore, the validity of the reading-aloud tests can be questioned as it is not evidence that students understand what they have read; an adequate word reading measure for Spanish as a Second Language should access the ability not only to derive appropriate phonological based representation but also to retrieve semantic information from the mental lexicon. As Perfetti and Hart (2002) indicate, the identification of a word is the retrieval of three constituents: the orthographic, the phonological, and meaning.

Our findings help to clarify the role of vocabulary knowledge when reading in Spanish as a second language. Perfetti et al. (2005) state, "Knowledge of word meanings may play a role at least in both the identification of a word (at least in an orthography that is not transparent) and in comprehension" (p. 241). Findings from this study help to clarify this role in L2 transparent orthographies. When dealing with children who are learning to read in Spanish as a second language, a distinction should be made between accurate word pronunciation and accurate word comprehension. Knowledge of word meanings is not necessary for accurate word pronunciation, but it is essential for the comprehension of isolated words and sentences.

6.5 CONCLUSION

The present study set out to examine the role of meaning and OLP skills in isolated word reading and sentence reading comprehension in Spanish as a second language. In particular, the study explored the relationship between five latent variables: Phonological awareness, Phonological Decoding, Meaning Identification, OLP, and Sentence Comprehension.

The study demonstrated that beginning readers who already know the letters of the alphabet can correctly pronounce a word but still fail to comprehend what they are reading. Investigators have tended to focus on the decoding aspect of reading or on comprehension, but there was no clear evidence of the specific relationship of these two variables when learning to read in an L2 transparent language. The data revealed that decoding can take place without comprehension and that decoding and meaning activation form two different, but dependent constructs.

The second aim of this study was to clarify the role of OLP. The results suggested that the contribution of Oral Language Proficiency depended on the nature of the dependent variable. As decoding does not involve meaning activation, OLP skills did not exert a direct effect on the decoding variance. Following the Psycholinguistic Grain Size Theory (Ziegler & Goswami, 2005, 2006), decoding skills could be explained just by knowledge of the letters and blending them together. However, contrary to some views that state that OLP does not exert any influence in beginning L2 isolated word reading (Geva, 2000), OLP skills contributed to isolated word reading when the outcome involved meaning activation.

Our results mirror those L1 studies which state that decoding and oral language proficiency are both necessary in order to accurately explain reading comprehension outcomes, and that neither skill is sufficient by itself (Hoover & Gough, 1990; Carver, 1998; Storch & Whitehurst, 2002; Muter et al., 2004). According to Carver, "being able to pronounce correctly unknown words certainly would not help comprehend sentences containing these words unless these words are known when listening" (1998, p. 146). In most L1 studies among beginning readers, as listening comprehension among native speakers is well-developed, the ability to decode individual words accounts for most of the variance in reading comprehension (Gough &

Tunmer, 1986; Hoover & Gough, 1990; Storch & Whitehurst, 2002). In this study, as listening comprehension and receptive vocabulary among L2 learners were not so well developed, decoding was necessary but not sufficient. Results revealed that both OLP skills and decoding skills contribute to variations in sentence comprehension, reinforcing the L1 view that successful sentence comprehension demands both accurate word decoding and the ability to comprehend what has been read.

7.0 EDUCATIONAL IMPLICATIONS, FUTURE STUDIES AND LIMITATIONS OF THE STUDY

7.1 EDUCATIONAL IMPLICATIONS

The findings suggest several implications for diagnosis and interventions for children learning to read in Spanish as a second language. First, the results of the first hypothesis highlight the importance of the choice of test. When only measures of reading words and pseudowords aloud are used, a child may give the impression of having good reading skills and, as a consequence, poor comprehension skills might not be identified. A measure of reading ability should ideally take into account both decoding and meaning identification skills.

Geva states that the development of oral language does not ensure the mastery of learning to read (2000, p.138). Results of this study reveal that the development of decoding skills does not ensure meaning activation. This implies that schools should emphasize both oral language skills and decoding skills. In agreement with Geva (2000), oral language and decoding skills should be taught concurrently rather than sequentially, as both constructs are necessary for comprehension development.

Once the children achieve the grapheme-phoneme correspondences, L2 learners studied here showed very few problems with decoding skills. However, accurate decoding was not enough to ensure sentence reading comprehension. Students failed to understand written words simply because those words were unfamiliar to them. The importance of vocabulary is highlighted, as the child needs to understand the words he or she is reading. This means that L2 teachers need to provide intensive vocabulary training to help their students acquire a larger vocabulary so that, when they meet these words in print, they will know what they mean. According to Verhoeven and Vermeer, “Reading vocabulary is crucial for effective L2 reading comprehension. Children should be encouraged to build a large sight vocabulary in order to access word meanings automatically” (2006, p. 206).

The results revealed that 38% of all the children interviewed did not pass the control task of knowing the letters of the alphabet. This result should be of particular concern as letter knowledge is crucial for the development of decoding skills and comprehension. Moroccan children who did not know the letters at the end of second grade did not perform at levels that would guarantee their successful acquisition of literacy. There was a strong chance that they would have to repeat a grade at the end of their second year. Most teachers blame this lack of letter knowledge on the low level of parental literacy, and on the fact that they are learning to read in a script different from the one seen at home (Siguán, 1998).

7.2 FUTURE STUDIES

In this study we claim that in simply reading a word aloud accurately, meaning is not activated, and that just retrieving the phonological form is not enough to establish the word in the orthographic lexicon. Mapping among phonological, orthographic, and semantic representations is necessary to establish a word in memory.

It is assumed that word identification and spelling depend on similar skills, phonological knowledge and orthographic knowledge (Arab-Moghaddan & Senegal, 2001). One interesting study would be to analyze if meaning is activated when spelling a word accurately in L2 transparent orthographies or, just as happens when pronouncing a word, meaning might not be activated. According to Landern and Thaler, "an orthographic lexicon is indispensable for spelling in German. Simply translating the sound sequence into adequate phonemes is not sufficient, but the child has to memorize the correct spelling" (2006, p. 124). In some cross-linguistic studies it has been noticed that while the correlation between English decoding and English spelling was high, the correlation was not so high between Hebrew decoding and Hebrew spelling (Geva et al., 1993). Arab-Moghaddam and Senechal (2001) claim that spelling in Persian was not predicted by phonological skills but by orthographic skills. Further research is necessary to clarify the roles of meaning and OLP when learning to spell in Spanish as a second language.

Research shows that reading accuracy as such is not a sufficient measure of reading proficiency. In fact, most research studies of learning to read in a transparent language use the task of reading efficiency (Verhoeven, 2000; Droop & Verhoeven, 2003). L2 research has demonstrated that OLP skills do not contribute to any significant variance when speed and accuracy of word and text decoding are taken into account (Geva & Yaghoub-Zadeh, 2006; Verhoeven & Vermeer, 2006). Fluency, testing the speed of reading words aloud is also used to test automaticity or sight-word reading. As happened in the case of word accuracy, it might be the case that meaning is not activated when a word is pronounced aloud with sufficient speed. Accordingly, assessing sight-word reading by the speed and accuracy of reading words aloud might not be a good task when testing in Spanish as a second language learners: The children might retrieve the phonological information very quickly because they might be very good at activating grapheme phoneme correspondence, but they may be very slow at activating the meaning. Thus, further research to test the involvement of meaning when L2 word reading fluency is tested is necessary.

Another interesting future study would be to compare the results of this study with Moroccan children learning to read in L2 Catalan. Similar to English orthography, Catalan pronunciation can not be predicted from its orthography. By comparing our results with children learning to read in L2 opaque orthographies, we can determine whether the finding that decoding and meaning identification form different constructs is due to reading in a L2 or to reading in L2 transparent orthography.

7.3. LIMITATIONS OF THE STUDY

A major limitation of this study was that it examined only sentence comprehension and not text comprehension. The reason for doing so was to avoid having take into account other higher level processes such as syntactic awareness, grammar knowledge, making inferences, or monitoring comprehension. It has to be recognized that reading single sentences is a much simpler task than reading and interpreting paragraphs of texts.

The present study used few measures to test each latent variable. Some latent variables such as decoding, sentence comprehension and meaning identification had to be tested with only a single observed latent variable. The decision was made mainly on the basis of the number of people that would be necessary to run SEM if more variables were added to the model.

Furthermore, it was felt that adding more tasks might create fatigue on the part of the participants, who were tested in two sessions. However, if possible, future studies could include more measures for each latent variable.

The third limitation of the present study might be the focus on Moroccan children who were learning to read in their second language for the first time. The generalizability of the present findings to other immigrant groups that have already learned to read in their first language is therefore limited.

Another limitation of this study was the lack of information about the children's home literacy environment. Parental education (and mother's education in particular), expectations for the child, parental teaching, and parental views on education have all been identified as very powerful predictors of a child's literacy development (Stoep, Bakker & Verhoeven, 2003). More information about how Moroccan literacy environment can influence literacy learning in Spanish as a second language is therefore necessary for future studies.

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APPENDIX A

CONSTRUCTS AND MEASURES

Construct and Observed variable name	Definition	Task	Scoring	Reference
PRINT KNOWLEDGE Concept about print	Children knowledge about how the act of reading is carried out	Students answer questions assessing knowledge of the book and print conventions	Number Correct /12	Sígeme luna Mary Clay (1979)
PRINT KNOWLEDGE Letter identification	Identifying the names of letters and the sounds they represent.	Provide the letter name or the sound of a given letter	Number Correct /20	PROLEC Cuetos (2002)
PA (in.sy.pa) Intrasyllabic awareness	The ability to identify the intra-syllabic elements of the spoken word	Students are presented with three syllables and they chose the onset or rhyme that is different	Number Correct /16	PCI Jiménez (2001)
PA Phoneme blending	The ability to manipulate the phonemes of the spoken word.	Students hear a word broken into individual phonemes and must blend the sound together to say the word	Number correct /15	PCF Jiménez (201)
OLP Listening comprehension	The ability to comprehend oral language in context	Students choose a picture according to the sentence heard	Number Correct /15	Sub test Aprenda (1997) Harcourt brace

OLP Oral. Voc Receptive vocabulary	The ability to recognize the phonological label of a word and associate it with a concept.	Students choose a picture according to the word heard	Number correct until students made 6 consecutive mistakes	TVIP Dunn and Padilla (1996)
DECODING **Real-word** Real word decoding **Pseudoword** Pseudoword Decoding	The ability to pronounce words and pseudowords when seen in print	Students read aloud real words Students read aloud pseudowords	Number correct/30 Number correct/30	PROLEC Cuetos, (2002) PROLEC Cuetos, (2002)
MEANING **Word.pic** Word-picture matching **Read.voc** Picture-Word Matching	The retrieval of a phonological form and the activation of meaning of a word seen in print	Students match a word with a picture Students match a picture with a word	Number correct/30 Number correct until students make 6 consecutive mistakes	Subtest of the Aprenda Peabody Picture Vocabulary test in Spanish
SENTENCE Sentence comprehension	The ability to retrieve information from a sentence and to interpret it appropriately	Students have to perform the actions corresponding to the sentence read Students have to select the appropriate picture according to the sentence read. Students have to draw a picture according to the sentence read	Number correct/ 12 /3 /3 /6	PROLEC Cuetos (2002)

APPENDIX B

EARLY PHONOLOGYCAL AWARENESS TASK

Oddity tasks:

1. **Rime identification**

Let's play a game. It is the game of sounds. I am going to tell you three sounds and you have to tell me which one sounds different. Listen: pon-don-ral, do they sound the same? Which one sounds different?

Example: fil- zar-bil

1. Listen how they sound: nal – gal- chon, which one sounds different?
2. van- les- fan
3. gal-don-ton
4. cal- ral-jez
5. dez-tin-fin
6. tal-min-dal
7. til-rril-vaz
8. mar-cion-llar

2. Onset identification

Let's play a game. It is the game of sounds. I am going to tell you three sounds and you have to tell me which one sounds different. Listen: gra- gri- blo, do they sound the same? Which one sounds different?

1. Listen how they sound: *flo, fle, dri,* which one sounds different?
2. bra-fle-bri
3. bre-cla-clo
4. cra-cre-flu
5. bro-plu-bra
6. fro-bla-bli
7. pre-glo-pri
8. cla-pro- pre

APPENDIX C

LATE PHONOLOGICAL AWARENESS TEST: BLENDING

Let's play a game, it is a game where you have to guess the word. Pay attention. Listen what I am going to say /s/-/o/-/f /- /á/. (three seconds between each phoneme) What word is it? The word is /sofa/ . Now listen to this, and let's see if you can guess the word /m/-/o/- /t/-/o/. What word is it? The word is moto, did you understand the game. Now, I am going to tell you some words in a secret code and you have to tell me what word it is:

Words composed of CVC	Words composed of CVC	Words composed of consonant clusters
1. S-O-L 2. M-A-R 3. COL 4. P-A-N 5. M-A-L	6. B-E-S-O 7. S-E-T-A 8. T-O-RR-E 9. V-I-N-O 10. N-I-D-O	11. P-L-A-N-O 12. B-R-U-J-A 13. F-L-A-N 14. P-L-A-T-O 15. F-R-A-S-E

APPENDIX D

PRINCIPAL CONSENT FORM

Date

Dear Sirs:

As principal of the ______________________________________ school, I authorize Marina Saiz to carry out her research in my center with the Moroccan students of first grade.

This research is Marina's doctoral dissertation at the University of Pittsburgh.

This study will generate valuable information for the development of second language literacy and therefore, for reading instruction.

In this research children will be tested in oral vocabulary, phonemic awareness, (awareness of rhymes and isolated letter sounds), word and sentence reading.

All information gathered during the research will be strictly confidential. The school will receive a summary with the results of this study.

Sincerely yours