

Phonological Awareness in Learning Literacy

JUAN E. JIMÉNEZ GONZÁLEZ
MARÍA DEL ROSARIO ORTIZ GONZÁLEZ
University of La Laguna



Abstract

The present research examines accessibility to different levels of phonological awareness, and their relationship to the mastery of the alphabetic code in Spanish language. Some linguists have suggested that different phonological units exist in the Spanish language. The main objective was thus to verify whether or not such linguistic realities are psychological realities as has been found in the English language. Finding out if the subjects are able to represent these linguistic units in their memories is justified by the importance that these cognitive processes have in the acquisition of an alphabetic code. The first study aimed to discover if a sample of pre-reader subjects was able to represent certain phonological units such as syllables, intrasyllabic units (onset-rhyme) and phonemic units in their memories. The second study was designed to verify the existing relationship between different levels of phonological awareness and the mastery of the alphabetic code, measured by using grapheme-phoneme conversion rules in a pseudoword task. The results obtained suggest that the pre-reader subjects are more sensitive to syllabic units, than to intrasyllabic and phonemic units. Similarly, a greater mastery of the alphabetic code is associated with higher levels of intransyllabic and phonemic awareness.

Conocimiento fonológico y lenguaje escrito

Resumen

La presente investigación trata de estudiar la accesibilidad a diferentes niveles de conocimiento fonológico y su relación con el dominio del código alfabético en lengua española. Algunos lingüistas sugieren la existencia de diferentes unidades fonológicas en la lengua española. En este sentido, se ha tratado de verificar si tales realidades lingüísticas constituyen o no realidades psicológicas como ya ha sido constatado en la lengua inglesa. Conocer si los sujetos son capaces de representar en su memoria estas unidades lingüísticas está justificado por la importancia que estos procesos cognitivos tienen en la adquisición de un código alfabético. El primer estudio trata de averiguar en una muestra de sujetos prelectores si son capaces de representar en su memoria determinadas unidades fonológicas, tales como, las sílabas, unidades intrasilábicas (onset-rima) y unidades fonémicas. El segundo estudio fue diseñado para comprobar la relación existente entre estos niveles de conocimiento fonológico y el dominio del código alfabético medido a través del uso de las reglas de conversión grafema-fonema en una tarea de lectura de pseudopalabras. Los hallazgos obtenidos sugieren que los sujetos prelectores son más sensibles a unidades silábicas en comparación a unidades intrasilábicas y fonémicas. Asimismo, un mayor dominio del código alfabético está asociado a niveles superiores de conocimiento intrasilábico y fonémico.

Authors's Address: Departamento de Psicología Educativa, Evolutiva y Psicobiología. Universidad de La Laguna. 38071 La Laguna. Santa Cruz de Tenerife, Spain.

This study was designed to establish the existence of different levels of phonological awareness and their relationship with the mastery of the alphabetic code in Spanish language. The article focusses on two topics which have been the object of research in recent years. The first refers to the study of phonological awareness and the second, to the influence this awareness has on the acquisition of literacy.

Levels of phonological awareness

Phonological awareness is a form of metalinguistic awareness and refers to the ability to carry out mental operations on speech (Morais, 1991; Tunmer & Herriman, 1984; Tunmer & Rohl, 1991). With regard to the levels of phonological awareness, two types of interpretations (Treiman and Zukowski, 1991) were used. The first relates to the fact that phonological awareness does not constitute a homogeneous entity, but rather is expressed in terms of awareness of different linguistic units. However, on this point some confusion on the use of the term phonological awareness exists, as has been noted in recent publications. Tunmer and Rohl (1991) used the term to refer exclusively to phonemic awareness, while Man (1991) and Morais, Alegría and Content (1987) included syllabic awareness. On the other hand, Treiman (1991) interprets phonological awareness to mean awareness of any phonological unit, be it syllables, onsets, rhymes or phonemes. The second interpretation of the term suggests that levels of phonological awareness are established in accordance with the difficulty of the task. This difficulty may vary depending on the linguistic, analytic and memory demands required. Some authors (Leong, 1991; Morais, 1991) make a distinction between classification or pairing tasks and segmentation tasks (for example those that require the manipulation of isolated elements), considering classification tasks to be easier.

From a psychological perspective, the research carried out deals with the type of linguistic unit that the subjects are able to represent in their memories, due to the importance that these processes have in the acquisition of alphabetic code. There is evidence that the subjects use this type of linguistic unit, although there is not always agreement regarding the stage of development where this emerges. Some authors (e.g., Calfee, Chapman & Venezky, 1972; Liberman & Shankweiler, 1977; Liberman, Shankweiler, Fischer & Carter, 1974; Rosner & Simon, 1971) indicate 4-5 years old, while others put it at around 6 years old (Bruce, 1964). These discrepancies respond to the different levels of linguistic awareness which are being considered. Thus, many of the studies compared the levels of syllables and phonemes demonstrated that syllabic awareness precedes phonemic awareness. So for example, in the work of Rosner and Simon (1971) tasks on the omission of consonant sounds in medial or initial position were more difficult for preschool children. At the same level, Liberman et al. (1974, 1977) demonstrated that counting syllables was easier than counting phonemes. In view of these results it was suggested that the syllable is the basic unit of articulation because it has greater perceptual salience, making it easier to detect in speech. However, awareness of phonemes is somewhat more difficult for children because phonemes appear co-articulated in words. The universality of this finding was confirmed in different cross-cultural studies, such as that carried out by Cossu, Shankweiler, Liberman, Ratz and Tola (1988) who compared the segmentation of syllables and phonemes in Italian children and American children. They found that success was greater in carrying out syllabic segmentation tasks than in phonemic awareness tasks.

However, some authors (e.g., Treiman, 1983) have indicated the existence of intermediate stages between the syllable and the phoneme. From a linguistic point of view there is evidence that the syllable in English has an onset-rhyme hierarchy structure as opposed to a lineal structure, as suggested by linguists such as Halle and Vergnaud, 1980. In some studies of speech production, syllabic onset functions as a unit (e.g. Claxton, 1974; MacKay, 1972). More recent studies demonstrated that the onset-rhyme units are easier to learn than other clusters (Treiman, 1983). Similarly, it was demonstrated that if the onset-rhyme is manipulated then familiarity with the syllable structure is increased (Treiman, 1985; Treiman & Baron, 1981). Some studies demonstrated that pre-school children are already sensitive to rhyme (e.g., Bryant & Bradley, 1985; Stanovich, Cunningham & Cramer, 1984).

More recently, Treiman and Zukowski (1991) compared the awareness of three linguistic levels, syllables, onsets, rhymes and phonemes in pre-school and first grade children. The findings suggested the existence of developmental progression from syllable awareness to intrasyllabic units awareness (onset-rhyme), and finally, to phonemic awareness. This means that there is a stage in development where children are ready to divide syllables into onsets and rhymes, but they have difficulty in grasping the internal structure. They can analyze or divide words into intrasyllabic units, but they are unable to separate the onset and the rhyme into phonemes.

These empirical findings in the English language support the psychological importance of an intermediate stage of intrasyllabic awareness which occurs between syllabic and phonemic awareness. Can these results however be extrapolated to the Spanish language? Some linguists (Harris, 1983) also suggest the existence of different linguistic levels and particularly the components of onset and rhyme in the Spanish syllable. In the Spanish language however, these psychological "realities" have not been verified in empirical studies.

From a linguistic point of view, it is suggested that the Spanish syllable has a ternary-branching organization whose primary constituents are the onset (O), the nucleus (N), and the coda (C), of which the first and last are optional. Any consonantal segment may constitute an onset, this being an optional constituent of the syllable in Spanish. Not all onsets occur in the word-initial position, there are also those which occur in the word-internal position. Two-segment onsets consist of a single obstruent or fricative followed by one of the liquids *l* or *r*. The rhyme is the obligatory constituent containing the sonority peak, and the rhyme constituent has its own internal structure. These are some of the most salient features of linguistic units in Spanish. (For a more detailed account see Harris, 1983).

It is also worth noting that the psychological reality of the onset-rhyme unit has been questioned and therefore the hierarchic model of levels of phonological awareness is also put in doubt. For example, Carlisle (1991) suggested that performance in phonological awareness depends more on the type of task than on linguistic knowledge. Better performance in onset rhyme tasks is due to greater familiarity with the task given that pre-school experiences are based on rhyme games and word searches which begin with a specific onset. Consequently this would contribute to the fact that the attention of the children is centered on the onset-rhyme situation. For this reason, the acceptance of onset-rhyme as a different and identifiable level of linguistic analysis should be confirmed by research dealing with the analysis of syllables. Furthermore, the onset-rhyme unit in different kinds of syllables and words should be of the same prominence for the learner. If it is only verified in syllables with CV and CVC structure, then it should be regarded as a way in which people segment syllables and not as an intermediate stage.

Phonological Awareness and acquisition of the alphabetic code

The learning of literacy in alphabetic orthography demands metalinguistic effort, because such a system reflects the phonological units of speech. These units are abstract therefore children must first learn how to manipulate phonological codes in their memory and discover their relationship with graphemes (Alegria, 1985). Correlational studies have demonstrated that phonological awareness is directly related to the learning of reading in alphabetic systems (Calfee, P. Lindamood & C. Lindamood, 1973; Fox & Routh, 1975; Liberman et al., 1974; Rosner & Simon, 1971; Treiman & Baron, 1981; Tunmer & Nesdale, 1985; Sebastián & Maldonado, 1984, 1986). Likewise, longitudinal studies have been carried out in which phonological awareness was measured before starting learning to read, to later compare its effect on the levels of reading ability reached. Some studies found that syllabic awareness is a better predictor of future reading ability (Carrillo, Romero & Sánchez, 1992; Mann & Dituno, 1990; Mann & Liberman, 1984) while others considered the rhyme (Bradley & Bryant, 1985; Bryant, Maclean, Bradley and Crossland, 1990; Ellis & Large, 1987). And finally, there are those who have suggested phonemic awareness is the best predictor (Calfee, 1977; Juel, Griffith and Gough, 1986; Mann, 1984; Stanovich, Cunningham & Cramer, 1984; Warren-Leubecker & Carter, 1988). In other studies (Lundberg and Høien, 1991; Lundberg, Olofsson and Wall, 1980; Share, Jorm, MacClean and Matthews, 1984) both intrasyllabic and phonemic awareness have a predictive relationship to later reading achievement.

This area has not only been studied from a statistical perspective through correlational and longitudinal studies, but has also been approached experimentally via training studies (Lewkowicz, 1980; Olofsson, 1989; Treiman & Baron, 1983; Williams, 1980): in some studies both approaches have been combined (Bradley and Bryant, 1983).

In comparison to reading research however, the study of the relationship between phonological awareness and writing has received less attention, but there is empirical evidence that supports a causal link (Lundberg, Frost and Petersen, 1988; Rohl & Tunmer, 1988). Despite these studies it is nevertheless still not clear whether or not phonological awareness is a precondition or a consequence of learning to read. A third opinion can be added to this which attempts to reconcile the opposing views by defending a reciprocal relationship between phonological awareness and reading.

Phonological awareness as a precondition

The defenders of this view, represented in Europe by the Oxford group (Bradley & Bryant, 1983, 1985; Bryant et al., 1990; MacClean, Bryant & Bradley, 1987) and the Umea Group (Lundberg & Høien, 1991; Lundberg et al., 1980; Lundberg et al., 1988; Olofsson & Lundberg, 1985) are of the opinion that phonological awareness not only facilitates reading acquisition but that it is a precondition of learning to read. This opinion is based on the belief that early reading skills depend on learning the relationship between graphemes and phonemes. Thus, it is necessary for children to be already aware of the different units of language. This awareness is directly related to the development of reading skills (Backman, Bruck, Herbert &

Seidenberg, 1984; Manis & Morrison, 1985) and is essential in reading pseudowords. Perfetti and Hogaboam (1975) demonstrated that the tasks which best predict individual differences in reading are those based on speed and accuracy in naming pseudowords.

Similarly, the idea that phonological awareness is a precondition for learning to read is also supported by studies in which the reading of pseudowords is considered to be a criteria variable (Perfetti, Beck, Bell & Hughes, 1987), studies which excluded subjects who demonstrate any reading ability (Bradley & Bryant, 1985; Tunmer, Herriman & Nesdale, 1988), and studies which include a statistical control of reading ability in pre-school children (Vellutino and Scanlon, 1987).

Many researchers have focussed on demonstrating that phonological awareness can precede instruction in reading. For example, there is evidence of syllabic and phonological sequence awareness both in children (Bradley Bryant, 1983; Liberman et al., 1974; MacLean et al., 1987) and in illiterate adults (Kolinsky, Cary & Morais, 1987; Morais, Bertelson, Cary & Alegría, 1986). Intrasyllabic awareness can be developed without knowledge of the alphabet system, as suggested by Treiman and Zukowski (1991), since pre-reader children are ready to separate syllables into onset and rhyme units (Bradley & Bryant, 1983, 1985; Bryant et al., 1990; Ellis & Large, 1987; Lundberg & Høien, 1991; Lundberg et al., 1980; Share et al., 1984). With regard to phonemic awareness, there is evidence that subjects with no experience of the alphabetic code can access phonemic units. These include children, (Lundberg et al., 1988; Mann, 1984); readers using non-alphabetic systems, particularly Japanese children (Mann, 1986) and Taiwanese adults (Tzeng & Chang, in press, study cited in Mann, 1991).

Phonological awareness as a consequence

From this perspective awareness of phonemic segments is an effect of learning to read and write an alphabetic orthography. This opinion is supported by studies with pre-reader children (Alegría & Morais, 1979; Yopp, 1988), illiterate adults (Morais, Cary, Alegría & Bertelson, 1979; Morais, Content, Bertelson, Cary & Kolinsky, 1988), and non-alphabetic readers (Mann, 1986; Read, Zhang, Nie & Ding, 1986). However, a more detailed analysis of these studies suggests that only phonemic awareness can be considered an effect of learning the alphabetic code, as some of the authors of these studies later recognized. In contrast, it is accepted that syllabic awareness can be developed without reading instruction, evidence of which is given in several studies reviewed and cited in this article, and also, that illiterate adults can solve syllabic awareness tasks (Kolinsky et al., 1987; Morais et al., 1986). Moreover there are no doubts about the existence of intrasyllabic awareness in pre-readers.

Thus, controversy is reduced to the directionality between phonemic awareness and learning to read. In short, four hypotheses have been formulated which to aim to resolve such controversy:

1) Phonemic awareness has a causal link with the acquisition of alphabetic code. This hypothesis implies that phonemic awareness would be found in pre-readers, illiterate adults and non-alphabetic readers.

2) Phonemic awareness is an effect of learning to read. Consequently, phonemic awareness would only be found in readers.

3) Phonemic awareness could be a precondition as well as a consequence of learning to read. From this perspective, beginner readers should have achieved a minimum level of phonemic segmentation ability in order to acquire basic reading skills, which would in turn provide a basis for achievement in more complex phonemic tasks such as phoneme deletion or phoneme reversal (Mann, 1991).

4) Finally, a reciprocal relationship is proposed between phonemic awareness and learning to read once children have acquired the alphabetic code. Supporters of this position (e.g., Morais, 1991) suggest that reading instruction permits access to more elaborate levels of phonemic awareness, which also facilitate progress in literacy learning.

Study 1

This first study was designed to compare different levels of phonological awareness in a sample of Spanish pre-reader children. Oddity tasks similar to those used by Treiman and Zukowski (1991), but using only a trio of syllables, were employed. The main reason for selecting syllables is that it is difficult to find monosyllabic words in Spanish where the syllabic structure can be manipulated. Treiman and Zukowski (1991) used oddity tasks where the first consonantal segment coincides in words with two-segment onsets. However, they did not compare achievement when there was a coincidence in the second consonantal segment. We can predict that it would be easier for children when both syllables begin with two-segment onsets, and it would reflect that children use the onset as a perceptual category unit. We designed a different trio of syllables where such conditions were satisfied. Likewise, we used tasks where the children had to isolate syllables and divide words into syllables. In spite of the use of different tasks, all of them were familiar to the children. The exercises in nursery school for pre-school age children were based on words divided into syllables, or games (e.g., in Spanish "veo-veo"; in English "I spy") based on word searches which began with consonantal segments in the initial position (onset), or to identify words which had the same end syllable (rhyme). From this perspective, we thought that the levels of phonological awareness studied could be understood as linguistic units and not as cognitive demand tasks.

Method Subjects

A sample of 33 Spanish pre-reader children of average socioeconomic backgrounds were selected. They attend several state kindergarten schools, and have an age range of 5-6 yrs with an average of 5,5 yrs.

Procedure

Two previously trained psychologists carried out the phonological awareness assessment. The tasks were carried out individually during two sessions per subject in a school room which had the appropriate conditions for this type of evaluation.

The tasks were presented randomly, each being preceded by two examples to ensure that the children understood the instructions.

Phonological awareness tasks

Syllabic awareness

Counting syllables. The children counted the syllables of words which were presented orally, and used aids such as fingers or cuisinaire rods. In the examples, the examiner pronounces a word tapped into syllables. The instructions were "Listen, <pe-ra> (pear). How many parts does it have? It has two, doesn't it? Let's do another one. Listen, <ca-ba-llo> (horse). How many parts does it have? It has three parts, doesn't it? Do you understand the game?" The examiner does not help the children any more in carrying out the task. Each word was presented individually and the examiner asked the children how many parts the word had. This task has 2 examples and 10 items.

Isolating vowel sounds. The children were shown several pictures of objects that began with vowel sounds and which the examiner pronounced. In the examples, the examiner presented a list of four pictures and asked the children the names of the pictures. The instructions were: "Let's move on to another game. I am going to show you some pictures. Look these pictures. Tell me the names of the pictures. There is an Indian, a watch, a pipe, a tap. Now, we have to guess which pictures begin with /i/. Here is an Indian, does it begin with /i/? Yes, it does. Now, here is a watch, does it begin with /i/? No, it doesn't. Now, here is a pipe, does it begin with /i/? No, it doesn't, it begins with /p/. Now, here is a tap, does it begin with /i/? No, it does not begin with /i/". The examiner does not help the children any more to carry out the task, and the subject has to identify the picture which begins with the vowel sound previously pronounced by the examiner. This task has 1 example and 2 items.

Isolating syllables. The children looked at several pictures, the names of which began with a syllable pronounced by the examiner. The instructions were similar to those of the preceding task. But in this case, the subject had to identify the picture which began with the syllable previously pronounced by the examiner. This task has 2 examples and 4 items.

Intrasyllabic awareness

Identifying rhyme. This task was composed of a series of eight trios of syllables with the structure CVC. Each trio was pronounced by the examiner and the children had to identify which syllable was different because it did not rhyme with the rest. Two syllables of each trio coincided with the rhyme, while one syllable had a different ending with regard to the vowel nucleus and coda (e.g., nal-gal-chon). The instructions were: "Let's have a game. This is a game of nonsense words. I'll tell you three nonsense words and you must tell me which word sounds different. Listen, <pon-don-ral>. Do they sound similar? Which word sounds different? /Ral/ sounds different because it ends in /al/, and the others sound similar because they end in

/on/. Now, I am going to tell you more nonsense words and you tell me which words sound different. This task has 2 examples and 8 items.

Identifying onset with two consonantal segments. This task was composed of a series of four trios of syllables with the structure CCV. Each trio was pronounced by the examiner, and the children had to identify which syllable was different because it did not begin with the same consonantal segments. Two syllables in each trio had the same onset unit, while one syllable had a different onset (e.g., flo-fle-dri). The instructions were similar to the preceding task, but in this case the subject's attention was drawn the first sound of each nonsense word via the examples. This task has 2 examples and 4 items.

Isolating initial onset. The children looked at several pictures beginning with a consonant that the examiner pronounced (e.g. the examiner told the children to identify the picture whose name began with /f/: a picture of a seal, a cock, a tractor, and a fish). The instructions were similar to those in isolating vowel sounds. This task has 1 example and 4 items.

Vowel phonemic awareness

Identifying the medial vowel phoneme and the same coda. This task was composed of a series of eight trios of syllables with the structure CVC. Each trio was pronounced by the examiner, and the children had to identify which syllable was different because it did not have the same medial vowel segment. Two syllables of each trio had the same rhyme unit, while one syllable had a different rhyme (e.g., bar-jar-nir). The instructions were similar to those of identifying rhyme. This task has 2 examples and 8 items.

Identifying the medial vowel phoneme and different coda. This task was composed of a series of eight trios of syllables with the structure CVC. Each trio was pronounced by the examiner, and the children had to identify which syllable was different because it did not have the same medial vowel segment. Two syllables of each trio had the same medial vowel unit, while one syllable had a different medial vowel unit (e.g., con-car-cal). The instructions were similar to those identifying rhyme. This task has 4 examples and 8 items.

Consonantal phonemic awareness

Identifying the first consonantal segment of onset. This task was composed of a series of eight trios of syllables with the structure CCV. Each trio was pronounced by the examiner, and the children had to identify which syllable was different because it did not have the same first consonantal segment. Three syllables had the same second consonantal segment, but one syllable had a different first consonantal segment (e.g., gru-fra-gre). The instructions were identical to those of identifying onset with two consonantal segments, but the attention of the subjects was drawn to the initial consonant. This task has 2 examples and 8 items.

Identifying second consonantal segment of onset. This task was composed of a series of eight trios of syllables with the structure CCV. Each trio was pronounced by the examiner, and the children had to identify which syllable was different because it did

not have the same second consonantal segment. Three syllables had the same first consonantal segment, but one syllable had a different second consonantal segment (e.g., pra-pri-ple). The instructions were identical to those of identifying onset with two consonantal segments, but the attention of the subjects was focused on the second consonant. This task has 2 examples and 8 items.

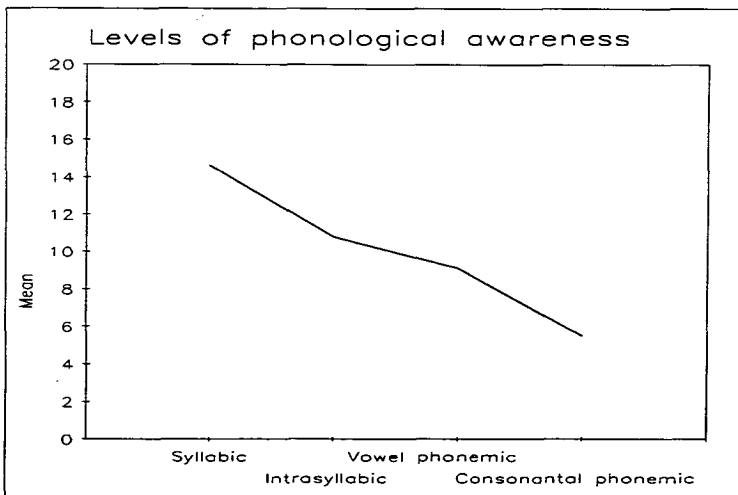
Results

Table I shows the descriptive statistics of each of the levels of phonological awareness, and are represented in Figure 1.

TABLE I
Descriptive statistics of each level of phonological awareness (N=3)

| TASKS | MAX. SCORE | MEAN | SD |
|--------------------------------|------------|--------------|------|
| Syllabic awareness | 16 | 14.6 (91.2%) | 2.20 |
| Intrasyllabic awareness | 16 | 10.8 (67.5%) | 2.94 |
| Vowel phonemic awareness | 16 | 9.1 (56.8%) | 3.59 |
| Consonantal phonemic awareness | 16 | 5.5 (34.3%) | 1.90 |

FIGURE 1
Levels of phonological awareness in pre-readers



The results show that the pre-reader subjects achieved greater success when they had to resolve tasks which demanded syllabic awareness (e.g., to break down words into syllables or to isolate syllables). The percentage of success achieved was 91.2%. There are significant statistical differences between syllabic awareness and the other levels of phonological awareness evaluated. For example, we found the following results with syllabic awareness and intrasyllabic awareness ($t=8.26$; $p<.001$), with vowel phonemic awareness ($t=16.7$; $p<.001$) and with consonantal phonemic awareness ($t=9.30$; $p<.001$).

Thus, the tasks which demanded intrasyllabic awareness were found to be less difficult in comparison to phonemic tasks. With regard to onset-rhyme units the percentage of success was 67.5%. The differences found between vowel phonemic awareness ($t=3.00$; $p<.001$) and consonantal phonemic awareness ($t=10.2$; $p<.001$) were significant.

Finally, the phonemic tasks were found to be more difficult, with the subjects achieving a success rate of 56.8% for vowel phonemes and approximately 34.3% for the consonantal phonemes. However, we found with phonemic awareness that the accessibility to vowel phonemic units was significantly easier than with the consonantal phonemic units ($t=-5.34$; $p<.001$). With regard to phonemic awareness, the pre-reader subjects were using an onset strategy to resolve this type of task. We did not find any statistical differences ($t=0.27$; $p<.78$) between identifying the first consonantal segment of onset, and the task based on the identification of the second consonantal segment of onset.

Discussion

These findings suggest that children who have not yet learned the alphabetic code are more sensitive to certain linguistic units, which coincides with another study done with Spanish children (Jiménez, 1992). Tasks which demand syllabic awareness and intrasyllabic awareness are easier to resolve. The subjects, however, were not so sensitive to phonemic units. Moreover, signs of phonemic awareness were found but only with regard to vowel phonemes; there are no indications with regard to consonantal phonemes. Such conclusions stem from the non-existence of statistical differences between those tasks which demand greater consonantal phonemic awareness. This means that the subjects used a strategy based on onset, as Carlisle (1991) suggested, since no differences were found when we compared the condition which demanded the identification of the second consonantal segment of onset with the identification of the first consonantal segment. Similarly, achievement in trios of syllables which coincide with the two-segment onsets would be easier for children to resolve using the onset as a perceptual category unit.

Finally, these findings coincide with those obtained by Treiman and Zukowski (1991). Thus, in a sample of Spanish children who had not yet started learning the alphabetic code, a readiness to divide syllables into onsets and rhymes was demonstrated, although they had difficulty in grasping the internal structure. They could analyze or divide the words into syllables and intrasyllabic units, but they were unable to separate these into their constituent parts when consonantal phonemes were included.

Study 2

The aim of this study was to analyse what levels of phonological awareness are related to the acquisition of alphabetic code. We compared the achievement of three groups of subjects on different phonological awareness tasks. All groups had had reading instruction for two years, but had different levels of acquisition of the alphabetic code.

Method Subjects

The subjects were 80 second-grade children attending state schools. The sample was obtained from rural and urban zones and from average socioeconomic backgrounds. The mean age was 7 years and 5 months. The initial sample was divided into three groups of different pseudoword reading levels. This task assessed the reading of 40 pseudowords and was applied individually, each subject being recorded on tape. The errors in the pseudoword task were then counted, each error scoring 1 point. The first group ($n=27$), were good readers (i.e., they obtained scores corresponding to 25 percentil in errors registered in the pseudoword reading task); the second group ($n=26$), were disabled readers (i.e., they obtained scores corresponding to 75 percentil in errors registered in the pseudoword reading task); and the third group ($n=27$) were non-readers (i.e., they were not able to read pseudowords because they do not know how to use the systematic correspondence between graphemes and phonemes).

Procedure

Once the groups were formed, previously trained psychologists and psychology students gave the phonological awareness tasks during two sessions per subject. The tasks assessed three phonological awareness levels: syllabic awareness, intrasyllabic awareness (rhyme and onset), and phonemic awareness. All tasks were individually given during a two week period of the last term in second grade.

Phonological awareness tasks

Syllabic awareness

Counting syllables. The same task as used in study 1.

Comparing syllables in words. Twelve pairs of words were presented orally and the subject had to decide if each pair of words had a common syllable, whether in the initial or medial or final position. In the examples, the examiner explained the rules of the game to the subjects. The instructions were the following: "Listen, I am going to say two words, and you tell me if these words sound the same". The examiner stressed the pronunciation of the syllable that was the same in both words. "Listen <caña-carro> (stem-tank). Do they sound similar? How are they alike? They are alike in /ca/. Do you understand the game? Now, I am going to say more words and you tell me if they sound similar, and in what way they are the same. This task has two examples and 12 items.

Syllabic synthesis. This task assessed the skill to recognize and pronounce words which had previously been divided into syllables. All stimuli were registered on a cassette recorder in order to control the time interval (three seconds) between syllables of words. In the examples, the examiner explains the rules of the game which consists in discovering words. The instructions were the followings: "Now, let's move on to another game. This is a game where you have to discover the word. Listen to this recording <bi-go-te> (moustache). What word is that? The word is

<bigote>. Very good, do you understand the game? Now, listen and tell me what this word is". This task has 2 examples and 10 items.

Isolating syllables. The same task as used in study 1.

Intrasyllabic awareness

Identifying rhyme. The same task as performed in study 1, but here we used words. This task assessed the ability of the children to classify words on the basis of the rhyme unit (e.g., bucal-moral-vejez).

Identifying onset with two consonantal segments. The same task as performed in study 1, but here we used words. This task tested the ability of the children to classify words on the basis of the onset unit (e.g., craso-credo-flujo). In this case, the task has 2 examples and 8 items.

Isolating simple onset. The same task as utilized in study 1.

Phonemic awareness

At this level of phonological awareness we differentiated between tasks requiring the subjects to compare vowel phonemes and consonant phonemes. Although the tasks were the same as in study 1, we used words.

Vowel phonemic awareness

Identifying the medial vowel phoneme and the same coda. In this case, all words of each trio had the stressed syllable in the final position, and it was in this syllable that the different vowel phoneme occurred (e.g. dosel-senil-viril). The coda was the same in all three words.

Identifying medial vowel phoneme and different coda. Here all words of each trio also had the stressed syllable at the end, and it was in this syllable that the different vowel phoneme occurred (e.g. jornal-barniz-lunar). The coda was different in all three words.

Consonantal phonemic awareness

Identifying the first consonantal segment of onset. All words of each trio had the stressed syllable in the initial position, and it was in this syllable that the different consonantal phoneme occurred (e.g., clipe-clero-plaga). This task had 8 items.

Identifying the second consonantal segment of onset. All words of each trio had the stressed syllable in the initial position, and it was in this syllable that the different consonantal phoneme occurred (e.g., clanes-crema-croto). This task had 8 items.

Results

We carried out a variance analysis to find out if there were differences in phonological awareness levels between the groups.

Tables II and III show both the results obtained and descriptive statistics.

TABLE II
Values F and T Duncan in each of the levels of phonological awareness

| LEVELS OF PHONOLOGICAL AWARENESS | F | T DUNCAN |
|----------------------------------|-----------|--------------------|
| Syllabic awareness | .99 | N.S.* |
| Intrasyllabic awareness | 9.76**** | I on II and III*** |
| Vowel phonemic awareness | 7.21**** | I on II and III ** |
| Consonantal phonemic awareness | 14.95**** | I on II and III*** |

TABLE III
Mean and standard deviation in each of the levels of phonological awareness as a function of different groups

| LEVELS | GRUPOS | | |
|--------------------------------|---------------|---------------|---------------|
| | I | II | III |
| Syllabic awareness | | | |
| M | 18.77 (52.1%) | 19.26 (53.5%) | 16.07 (44.6%) |
| DT | 10.33 | 8.65 | 7,61 |
| Intrasyllabic awareness | | | |
| M | 13.40 (67%) | 9.00 (45%) | 9.48 (47%) |
| DT | 3.94 | 4.74 | 3.20 |
| Vowel phonemic awareness | | | |
| M | 9.51 (59.4%) | 5.69 (35.5%) | 6.92 (43.2%) |
| DT | 4.07 | 3.99 | 3.11 |
| Consonantal phonemic awareness | | | |
| M | 9.66 (60.3%) | 4.61 (28.8%) | 6.03 (37.6%) |
| DT | 3.94 | 3.77 | 2.56 |

We observed that the differences between groups were not statistically significant at the syllabic awareness level ($F=0.99$; $p<.37$). This means that access to syllabic units does not depend on the knowledge of grapheme-phoneme correspondence rules. However, we found significant differences between the groups in intrasyllabic awareness ($F=9.76$; $p<.001$), vowel phonemic awareness ($F=7.21$; $p<.001$) and consonantal phonemic awareness ($F=14.9$; $p<.001$). The T Duncan revealed that the good readers differ from the disabled and pre-reader groups. This means that greater mastery of the alphabetic code is associated with more elaborate levels of phonological awareness (intrasyllabic and phonemic). However there were no significant differences in phonological awareness between disabled readers and pre-reader groups. It

indicated that failure in the acquisition of the alphabetic code was associated with lower levels of phonological awareness.

Discussion

The findings in this study reveal that onset and rhyme awareness and phonemic awareness is higher in good readers than in disabled readers and non-readers. However, awareness of these linguistic units is similar, both in disabled readers and in subjects who have received reading instruction but are not able to read. Good readers do not differ from disabled readers and non readers at the syllabic awareness level. This is significant because it implies that to acquire perfect mastery of the alphabetic code, a basic level of phonological awareness such as syllabic awareness, is not enough. Similarly, it does not appear that this awareness is increased by alphabetic code acquisition.

Overall, the results suggest that reading level is as much related to sensitivity to phonemes as to intrasyllabic units. Thus, these results support the idea expressed by Treiman (1991): phonemic awareness is not the only kind of phonological awareness that is important in learning to read; onset-rhyme awareness is also plays an important role in learning to read and spell.

Finally, the predictions from causal hypothesis are not confirmed by our results, as we found a low level of phonemic awareness in non-readers and disabled readers. This suggests that phonemic awareness is a consequence of learning to read. An acceptable level of phonemic awareness was found only in good readers.

Conclusions

The present research has not yet attempted to compare the results obtained from the two studies as each had different objectives. Study 1 analyzed whether pre-reader subjects were able to segment different units of language. Study 2 examined what levels of phonological awareness are most related to the mastery of alphabetic code. It would be risky to compare them owing to the differences in the tasks used in the different studies. We designed oddity tasks taking the age and short-term memory of the subjects into consideration, using syllables for younger age groups and words for older subjects.

Overall, the findings of the first study confirm the existence of different phonological awareness levels before the beginning of literacy learning. The results particularly support the Treiman (1991) hypothesis about the hierarchic model of phonological awareness levels. Thus, there is a progressive development from syllabic awareness to intrasyllabic unit awareness, and finally, to phonemic awareness. Similarly, the subjects had greater sensitivity to intrasyllabic units than to phonemic units. However, from the results obtained in this research with regard to the latter phonological level, it is necessary to make a distinction between vowel and consonantal phonemic awareness, as vowel phonemic units are more accessible than consonantal phonemic units. Evidence demonstrates that the tasks which demand vowel phonemic awareness are simpler and more natural (Wimmer, Landerl, Linortner y Hummer, 1991). In these studies vowel substitution tasks were used,

and it was found that subjects without reading ability managed to resolve some items; this was not the case with phoneme tapping or phoneme reversal tasks. Are vowel substitution tasks more difficult than, than phoneme tapping or phoneme reversal tasks? How do we account for the fact that results are better in substitution tasks than in tapping or reversal tasks? A possible explanation is that in vowel substitution tasks only vowel phonemes are manipulated, whereas in phoneme tapping or phoneme reversal, consonantal phonemes are especially manipulated. We think these findings favour the hypothesis that vowel phonemic units are easier to represent than consonantal phonemic units.

With regard to syllabic awareness, there is evidence that subjects are spontaneously aware of these kinds of linguistic units and that acquisition of other phonological awareness levels is preceded by syllabic awareness. The universality of such findings is confirmed by some cross-cultural studies (Cossu et al., 1988). On the other hand, we did not find that this phonological awareness level would be superior in subjects who had good mastery of the alphabetic code. This leads us to conclude that the syllable is easier to detect in speech because it has a greater perceptive prominence. However, we suggest that awareness of this unit does not appear so relevant when dealing with establishing correspondence between graphic and phonemic units in alphabetic reading; this does not happen, however, with phonemic and intrasyllabic units. With regard to phonemic units we found a low level of phonemic awareness in pre-readers, disabled readers and non-readers. This result does not support the hypothesis of a causal relation between phonemic awareness and learning to read. An acceptable level of phonemic awareness was only found in good readers. This result would be in accordance with the hypothesis that phonemic awareness is a consequence of learning to read.

Overall, the findings prove that intrasyllabic and phonemic units are directly related to reading acquisition, and this coincides with the results of other studies (Lundberg et al., 1980; Share et al., 1984; Lundberg & Høien, 1991). Consequently, this raises some questions for us. Why do the subjects who are successful in learning to read, achieve higher phonemic and intrasyllabic awareness levels? Why do pre-reader and disabled readers not differ in phonological awareness levels?

A minimum level of phonological awareness does not appear to be sufficient for the acquisition of reading. This is observed in non-readers and disabled readers from the second study who were exposed to reading instruction for two years, but did not increase phonemic or intrasyllabic awareness. It is possible that a specific threshold of accessibility to phonological units is necessary at the start of literacy learning. Once basic reading abilities are acquired, there would be a reciprocal relation between phonemic and intrasyllabic awareness and literacy learning, in accordance with the hypothesis formulated by Perfetti et al. (1987) and Morais (1991) on phonemic awareness, given that reading ability appears to favour access to superior levels of phonological awareness. We also recognize the existence of important limitations in the second study, which would suggest taking such interpretations with precaution. We did not know the phonological awareness levels of the subjects before beginning reading instruction.

Our results have practical implications for phonological awareness training in the Spanish language: activities dealing with the analysis of syllables into onsets and rhymes should be included in phonological training programs. With regard to rhymes, exercises should be included where children say if pairs of words coincide in the nucleus as well as the coda, or whether there is only coincidence in the nucleus. With reference to onset, activities should be included, that are first based on the

recognition of vowel sounds, and then on initial consonantal sounds that can be pronounced in isolation, such as the fricatives, nasals and liquids (Jiménez and Haro, 1993). Finally, the use of the alphabetic code as a support to facilitate the learning of correspondence between graphemes-phonemes should be essential.

References

- ALEGRIA, J. (1985). Por un enfoque psicolingüístico del aprendizaje de la lectura y sus dificultades (A psycholinguistic approach of learning reading and its disabilities). *Infancia y Aprendizaje*, 29, 79-94
- ALEGRIA, J., & MORAIS, J. (1979). Le développement de l'habileté d'analyse phonétique de la parole et l'apprentissage de la lecture. *Archives de Psychologie*, 47, 251-270.
- BACKMAN, J., BRUCK, M., HERBERT, M., & SEIDENBERG, M. (1984). Acquisition and use of spelling-sound correspondences in reading. *Journal of Experimental Child Psychology*, 38, 114-133.
- BRADLEY, L., & BRYANT, P.E. (1983). Categorising sounds and learning to read, a causal connection. *Nature*, 301, 419-521.
- BRADLEY, L., & BRYANT, P.E. (1985). *Rhyme and Reason in Reading and Spelling*. I.A.R.L.D. Monographs N° 1. Ann Arbor: University of Michigan Press.
- BRUCE, D. (1964). The analysis of word sounds by young children. *British Journal of Educational Psychology*, 34, 158-170.
- BRYANT, P.E., MACLEAN, M., BRADLEY, L., & CROSSLAND, M. (1990). Rhyme, alliteration, phoneme detection and learning to read. *Developmental Psychology*, 26, 3, 1-10.
- BRYANT, P.E., & BRADLEY, L. (1985). *Children's reading problems*. Oxford: Blackwell.
- CALFEE, R.C. (1977). Assessment of individual reading skills: basic research and practical applications. In A.S. Reber & D.L. Scarborough (Eds.), *Toward a psychology of reading*. New York: Lawrence Erlbaum Associates Inc.
- CALFEE, R.C., CHAPMAN, R., & VENEZKY, R. (1972). How a child needs to think to learn to read. En L. Gregg (Ed). *Cognition in learning and memory*. New York: Halsted Press.
- CALFEE, R.C., LINDAMOOD, P., & LINDAMOOD, C. (1973). Acoustic-phonetic skills and reading: kindergarten through twelfth grade. *Journal of Educational Psychology*, 64, 293-298.
- CARLISLE, J.F. (1991). Questioning the psychological reality of onset-rime as a level of phonological awareness. In S.A. Brady & D.P. Shankweiler (Eds.), *Phonological processes in literacy. A tribute to Isabelle Y. Liberman*. (pp. 85-95). Hillsdale, NJ: Lawrence Erlbaum Associates.
- CARRILLO, M., ROMERO, A., & SANCHEZ, J. (1992, September). *Development of Phonological-syllabic Awareness and Beginning Reading: A longitudinal study*. Paper presented at Vth European Conference on Developmental Psychology, Sevilla, Spain.
- CLAXTON, G.L. (1974). Initial consonant groups function as units in word production. *Language and Speech*, 17, 271-277.
- COSSU, G., SHANKWEILER, D., LIBERMAN, I.Y., KATZ, L., & TOLA, G. (1988). Awareness of phonological segments and reading ability in Italian children. *Applied Psycholinguistics*, 9, 1-16.
- ELLIS, N.C., & LARGE, B. (1987). The development of reading: As you seek so shall you find. *British Journal of Developmental Psychology*, 78, 1-28.
- FOX, B., & ROUTH, D.K. (1975). Analyzing spoken language into words, syllables and phonemes: A developmental study. *Journal of Psycholinguistics Research*, 4, 331-342.
- HALLE, M., & VERGNAUD, J.R. (1980). Three dimensional phonology. *Journal of Linguistic Research*, 1, 83-105.
- HARRIS, J.W. (1983). *Syllable structure and stress in Spanish. A nonlinear analysis*. Cambridge: Samuel Jay Keiser.
- JIMÉNEZ, J.E. (1992). Metaconocimiento fonológico: estudio descriptivo sobre una muestra de niños prelectores en edad preescolar (Phonological awareness: A descriptive study on preschool pre-reader children). *Infancia y Aprendizaje*, 57, 49-66.
- JIMÉNEZ, J.E., & HARO, C. (1993). Efecto del tipo de articulación y posición de la sílaba tónica en el conocimiento fonológico (Effects of linguistic structure on phonological awareness). Poster presented at I *Simpósium de Psicolingüística*, Pto. de la Cruz, Tenerife, Abril 1993.
- JUEL, C., GRIFFITH, P., & GOUGH, P. (1986). Acquisition of Literacy: A longitudinal study of children in first and second grade. *Journal of Educational Psychology*, 78, 4, 243-255.
- KOLINSKY, R., CARY, L., & MORAIS, J. (1987). Awareness of words as phonological entities: The role of literacy. *Applied Psycholinguistics*, 8, 223-232.
- LEONG, CH.K. (1991). From phonemic awareness to phonological processing to language access in children developing reading proficiency. In D.J. Sawyer & B.J. Fox (Eds.), *Phonological awareness in reading. The evolution of current perspective*. (pp. 217-254). New York: Springer-Verlag.
- LEWKOWICKZ, N. (1980). Phonemic Awareness Training: What to Teach and How to Teach it. *Journal of Educational Psychology*, 72, 686-700.

- LIBERMAN, I., & SHANKWEILER, D. (1977). Speech, the alphabet and teaching to read. En L.B. Resnick y P.A. Weaver (Eds.), *Theory and practice of early reading* (pp. 105-129). Hillsdale, NJ: Erlbaum.
- LIBERMAN, I.Y., SHANKWEILER, D., FISCHER, F.W., & CARTER, B. (1974). Explicit syllable and phone-me segmentation in the young child. *Journal of Experimental Child Psychology*, 18, 201-212.
- LUNDBERG, I., FROST, J., & PETERSEN, O. (1988). Effects of an extensive program for stimulating phonological awareness in preschool children. *Reading Research Quarterly*, 23, 263.
- LUNDBERG, I., & HOIEN, T. (1991). Initial enabling knowledge and skills in reading acquisition: print awareness and phonological segmentation. In D. Sawyer y B. Fox (Eds.) *Phonological Awareness in Reading. The evolution of current perspective*. New York: Springer-Verlag.
- LUNDBERG, I., OLOFSSON, A., & WALL, S. (1980). Reading and Spelling skills in the first school years predicted from phonemic awareness skills in kindergarten. *Scandinavian Journal of Psychology*, 21, 159-173.
- MACKEY, D.G. (1972). The structure of words and syllables: Evidence from errors in seech. *Cognitive Psychology*, 3, 210-227.
- MACLEAN, M., BRYANT, P.E., & BRADLEY, L. (1987). Rhymes, nursery rhymes and reading in early childhood. *Merrill-Palmer Quarterly*, 33, 255-282.
- MANIS, F., & MORRISON, F. (1985). Reading disability: A deficit in rule learning? In L. Siegel & F. Morrison (Eds.), *Cognitive development in atypical children* (pp. 1-26). New York: Springer-Verlag.
- MANN, V.A. (1984). Longitudinal prediction and prevention of early reading difficulty. *Annals of Dyslexia*, 34, 117-136.
- MANN, V.A. (1986). Phonological awareness: The role of reading experience. *Cognition*, 24, 65-92.
- MANN, V.A. (1991). Phonological awareness and early reading ability: One perspective. In D.J. Sawyer & B.J. Fox (Eds.), *Phonological awareness in reading. The evolution of current perspective*. (pp. 191-215). New York: Springer-Verlag.
- MANN, V., & DITUNNO, P. (1990). Phonological Deficiencies: Effective predictors of future reading problems. In G. Pavlides (Ed.), *Dyslexia: A neuropsychological and learning perspective* (pp. 105-131). Sussex, England: J. Wiley and Sons.
- MANN, V., & LIBERMAN, I.Y. (1984). Phonological awareness and verbal short-term memory: Can they presage early reading problems? *Journal of Learning Disabilities*, 17, 592-598.
- MORAIS, J. (1991). Phonological Awareness: A bridge between language and literacy. In D.J. Sawyer & B.J. Fox (Eds.), *Phonological awareness in reading. The evolution of current perspective*. (pp. 31-71). New York: Springer-Verlag.
- MORAIS, J., ALEGRIA, J., & CONTENT, A. (1987a). The relation between segmental analysis and alphabetic literacy: An interactive view. *Cashier de Psychologie Cognitive*, 7, 415-438.
- MORAIS, J., BERTELSON, P., CARY, L., & ALEGRIA, J. (1986). Literacy training and speech segmentation. *Cognition*, 24, 45-64.
- MORAIS, J., CARY, L., ALEGRIA, J., & BERTELSON, P. (1979). Does awareness of speech as a sequence of phones arise spontaneously? *Cognition*, 7, 323-331.
- MORAIS, J., CONTENT, A., BERTELSON, P., CARY, L., & KOLINSKY, R. (1988). Is there a critical period for the acquisition of segmental analysis? *Cognitive Neuropsychology*, 5, 347-352.
- OLOFSSON, A. (1989, April). *Phonemic awareness training before reading instruction: effects on learning to spell*. Paper presented at V Simposio Escuelas de Logopedia y Psicología del Lenguaje. Salamanca, Spain.
- OLOFSSON, A., & LUNDBERG, I. (1985). Evaluation of long term effects of phonemic awareness training in kindergarten: Illustrations of some methodological problems in evaluation research. *Scandinavian Journal of Psychology*, 26, 21-34.
- PERFETTI, C.A., BECK, I., BELL, L.C., & HUGHES, C. (1987). Phonemic Knowledge and learning to read are reciprocal: A longitudinal study of first grade children. *Merrill-Palmer Quarterly*, 283-319.
- PERFETTI, C.A., & HOGABOAM, T. (1975). The relationship between single word decoding and reading comprehension skill. *Journal of Educational Psychology*, 67, 461-469.
- READ, C., ZHANG, Y., NIE, H., & DING, B. (1986). The ability to manipulate speech sounds depends on knowing alphabetic spelling. *Cognition*, 24, 31-34.
- ROHL, M., & TUNMER, W.E. (1988). Phonemic segmentation skill and spelling acquisition. *Applied Psycholinguistics*, 9, 335-350.
- ROSNER, J., & SIMON, D.P. (1971). *The auditory analysis test: an initial report*. Learning Research and Development Center, University of Pittsburgh.
- SEBASTIAN, E., & MALDONADO A. (1984). La segmentación de palabras: un prerrequisito del aprendizaje de la lectura (Word segmentation: a precondition of reading learning). *Boletín del ICE de la UAM*, 9, 1-14.
- SEBASTIAN, E., & MALDONADO A. (1986). El desarrollo de la capacidad de segmentación de palabras en lectores jóvenes (Development of word segmentation ability in early readers). En J.E. Meisel (Ed.), *Adquisición del lenguaje - Adquisicao da linguagem*. Frankfurt, Main: Dieter Verlag.
- SHARE, D., JORM, A., MACLEAN, R., & MATTHEWS, R. (1984). Sources of individual differences in reading acquisition. *Journal of Educational Psychology*, 76, 1309-1324.
- STANOVICH, K.E., CUNNINGHAM, A.E., & CRAMER, B.R. (1984). Assessing phonological awareness in Kindergarten children: issues of task comparability. *Journal of Experimental Child Psychology*, 38, 175-190.

- TREIMAN, R. (1983). The structure of spoken syllables: Evidence from novel word games. *Cognition*, 15, 49-74.
- TREIMAN, R. (1985). Onsets and rimes as unit of spoken syllables: Evidence from children. *Journal of Experimental Child Psychology*, 39, 161-181.
- TREIMAN, R. (1991). Phonological awareness and its roles in learning to read and spell. In D.J. Sawyer & B.J. Fox (Eds.), *Phonological awareness in reading. The evolution of current perspective*. (pp. 159-189). New York: Springer-Verlag.
- TREIMAN, R., & BARON, J. (1981). Segmental Analysis: development an relation to reading ability. In G.C. MacKinnon & T.G. Waller (eds), *Reading research: Advances in theory and practice, vol III*. New York: Academic Press.
- TREIMAN, R., & BARON, J. (1983). Phonemic analysis training helps children benefit from spelling-sound rules. *Memory & Cognition*, 11, 382-389.
- TREIMAN, R., & ZUKOWSKY, A. (1991). Levels of phonological awareness. In S.A. Brady & D.P. Shankweiler (Eds.), *Phonological processes in literacy. A tribute to Isabelle Y. Liberman*. (pp. 67-83). Hillsdale, NJ: Lawrence Erlbaum Associates.
- TUNMER, W., & HERRIMAN, M. (1984). The Development of metalinguistic awareness: A conceptual overview. En W.E. Tunmer; C.Pratt y M.L. Herriman (Eds). *Metalinguistic Awareness in Children*. Berlin: Springer-Verlag.
- TUNMER, W.E., & NESDALE, A.R. (1985). Phonemic segmentation skill and beginning reading. *Journal of Educational Psychology*, 77, 417-527.
- TUNMER, W., Herriman, M., & Nesdale, A.R. (1988). Metalinguistic abilities and beginning reading. *Reading Research Quarterly*, 23, 134-158.
- TUNMER, W.E., & ROHL, M. (1991). Phonological awareness and reading acquisition. In D.J. Sawyer & B.J. Fox (Eds.), *Phonological awareness in reading. The evolution of current perspective*. (pp. 1-30). New York: Springer-Verlag.
- VELLUTINO, F., & SCANLON, D. (1987). Phonological coding, phonological awareness and reading ability: Evidence from a longitudinal and experimental study. *Merril-Palmer Quarterly*, 33, 321-363.
- WARREN-LEUBECKER, A., & CARTER, B.W. (1988). Reading and growth in metalinguistic awareness. Relations to socioeconomic status and reading readiness skills. *Child Development*, 59, 728-742.
- WILLIAMS, J. (1980). Teaching decoding with an emphasis on phoneme analysis and phoneme blending. *Journal of Educational Psychology*, 72, 1-15.
- WIMMER, H., LANDERL, K., LINORTNER., & HUMMER, P. (1991). The relationship of phonemic awareness to reading acquisition: More consequence than precondition but still important. *Cognition*, 40, 219-249.
- YOPP, H. (1988). The validity and reliability of phoneic awareness test. *Reading Research Quarterly*, 23, 159-177.