

The Effects of Syllable-Awareness Skills on the Word-Reading Performances of Students Reading in a Transparent Orthography

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Abstract

The present study investigates the effects of syllable awareness on the word-reading process of students reading in a highly transparent orthography (Turkish). The participants were 90 second graders belonging to one of two distinct levels of syllable-awareness skills (50 with poor syllable-awareness skills and 40 with proficient syllable-awareness skills). The students were tested individually, using three computerized paradigms that assessed their syllable-awareness skills and their efficiency at determining the identicalness of real- and pseudo-word pairs. The obtained data were analysed using two different MANOVAs and one-way ANOVAs. Findings from the present study point out that syllable-awareness skills were one of the most important indicators of the word-reading performances of students reading in a transparent orthography. In the discussion section, evidence is discussed on the basis of how syllable-awareness skills have a positive effect on the word-decoding process for a highly transparent orthography, and some practical suggestions are given regarding how teachers can embed these skills in their reading curricula.

Keywords: Reading, syllable awareness, Word decoding, phonology, Dual-route reading model.

Introduction

Reading is the most important aspect of educational activities, one of the fundamental academic skills that students are expected to acquire in their first few years of schooling. When the relationship between reading skills and academic achievement is analysed, it is found that students with poor reading skills cannot be expected to demonstrate successful performance in academic fields, and in fact their entire academic lives can be adversely affected by delays in acquiring reading skills (Güzel, 1998).

Despite the existence of different definitions in the literature, reading can be defined in the most functional way as follows: In the process of reading, readers first decode the words in the written texts by using appropriate orthographic, phonetic and morphological knowledge and skills. Later, they associate the words that they decoded with both their existing phonological lexicon and their previous knowledge and experiences, and so they comprehend the meanings of the words. Finally, by analysing the sentences that are

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composed of the words that they comprehended within the context of syntactic characteristics, readers arrive at the intended message (Güldenöğlü, Kargın & Miller, 2014). In many studies (Akyol, Çakıroğlu & Kuruyer, 2014; Catts & Kamhi, 2005; Faust & Kandelshine-Waldman, 2011; Gough & Tunmer, 1986; Nation, 2005; Tunmer, 2008; Tunmer & Greaney, 2010; Vaughn, Linan-Thompson & Hickman-Davis, 2003) where reading skills are tackled in detail, it is reported that observed reading problems stem from two main factors. One is the readers' basic decoding skills of converting written materials into speech. The other factor is the linguistic knowledge and skills that they possess with regard to comprehending the language they have been reading. From this perspective, it is possible to say that reading problems emerge either because of readers' limited decoding skills, as well as their limited linguistic knowledge and skills, or because of limitations that surface in both skills simultaneously (Gough & Tunmer, 1986; Tunmer, 2008; Tunmer & Greaney, 2010). When one considers that the most important objective of reading is to comprehend, it is necessary for readers to decode the words in written texts in an accurate way in order to achieve this objective. After decoding, readers should comprehend properly the words they have decoded. Although it is not adequate on its own for a successful reading performance, the literature shows that the possession of word-decoding skills is one of the important predictors of reading comprehension, and also that it is one of the basic prerequisite skills needed in order to enter the comprehension stage of the reading process (Güldenöğlü, Kargın & Miller, 2012; Hoover & Gough, 1990; Hoover & Tunmer, 1993; Kargın, et al., 2011; Kargın, Guldenöğlü & Miller, 2014; Lewis & Doorlag, 1983; Miller, Kargın & Guldenöglu, 2012; Ross, 1976).

When analysing the reading theories in which readers' word-decoding processes are described in detail, it can be seen that these processes are explained in terms of two basic word-reading theories. Phonological Word Reading Theory (Frost, 2006; Frost, Katz, & Bentin, 1987) states that the essence of reading occurs through phonological decoding. Readers first decode the phonological structure blocks (letter and syllable combinations) and later they associate these phonologically decoded words with meanings already in their own phonological lexicon. The Dual-Route Cascaded Word Reading Model, (Jackson & Coltheart, 2001), however, claims that readers decode words by adopting two different routes/strategies (lexical or nonlexical processing strategies). According to this theory, during the utilization of the nonlexical route, which is based on phonological foundations, readers decode the words by dividing them into phonological structure blocks, as mentioned in the previous theory. However, during utilization of the lexical reading route, which is based on a phonological lexicon, they rely on a process that connects the letter strings of written words with permanent orthographic knowledge (representation) that mediates their meaning. According to this theory, when readers first encounter words that are not in their personal phonological lexicon, they use the phonological/nonlexical route. When they have come across the same word a few times, however, they use the orthographic/lexical route, since they now have a prior input into their phonological lexicon with regard to these words.

When the contents of the above-mentioned word-reading theories are considered, it can be seen that becoming phonologically knowledgeable and skilful in the word-decoding process is a common and indispensable characteristic of both theories. Research underlines the fact that, particularly in the first years of primary school, the phonological knowledge and skills that students are expected to gain are among the most powerful predictors of their future reading performances (Ehri, Nunes, Stahl & Willows, 2001; Kjeldsen, Kärnä, Niemi, Olofsson & Witting, 2014; Rakhlin, Cardoso-Martins & Grigorenko, 2014; Report of the National Reading Panel, 2000; Schatschneider, Carlson, Francis, Foorman & Fletcher, 2002; Share, 1995; Shaywitz & Shaywitz, 2005; Snow, Burns & Griffin, 1998; Stanovich, 2000; Troia, 2004; Vellutino, Fletcher, Snowling & Scanlon, 2004).

In addition, in different studies on this subject, many researchers indicate strong relationships between fluent reading and gaining these skills at early stages (Ehri, 2002; Frost, 1988; Paap & Noel, 1991; Perfetti, 1985; Samuels & Farstrup, 2006; Therrien, 2004; Torgesen, 1999). From this perspective, it is evident that phonological knowledge and skills are among the basic capacities required for a successful word-decoding performance. When we look at the skills emphasized in the literature as the ones that impact on fluent word-decoding skills, we see that they can generally be grouped as grapheme-to-phoneme conversion skills, independent phoneme-decoding skills and syllable-awareness skills (Durgunoğlu & Öney, 1999, 2002; Öney & Durgunoğlu, 1997; Öney & Goldman, 1984). In this study, our objective is to analyse the effect of syllable-awareness skills on word-reading performances.

Syllable awareness is one component of phonological awareness. It is developed towards the beginning of the phonological-awareness sequence of skills. It is generally mastered in kindergarten as an auditory skill, but once children start to become readers during the first year of schooling, teachers should introduce letter tiles or squares and manipulate them to form sounds and words. The syllable-awareness skill, which basically means the ability to distinguish between the phonemes that constitute words, can be further defined as the ability to recognize different combinations of phonemes in word structures that are constructed based on alphabetic principles (Ott, 1997; Wright & Jacobs, 2003).

When syllable structures in Turkish are analysed, it is seen that syllables can be constructed in six different ways, depending on the number of sounds in the syllables and the location of these sounds in the syllables (Banguoğlu, 1986). These structures are as follows: 1) syllables with one vowel (V), 2) syllables with one vowel and one consonant (V+C), 3) syllables with one vowel and two consonants (V+C+C), 4) syllables with one consonant and one vowel (C+V), 5) syllables with one consonant, one vowel and one consonant (C+V+C) and 6) syllables with one consonant, one vowel and two consonants (C+V+C+C). While the first three structures are used only in the first syllable of a word, the other three can be used at the beginning, middle or end of a word. In addition, as can be understood from this classification, syllables in Turkish can have a minimum of one letter and a maximum of four letters, and there can be only one vowel in them. Although this explanation depicts a complex structure and varying characteristics of the Turkish language, research in the literature shows that different syllabic organizations in Turkish words can be perceived much more easily than ones in opaque orthographies, due to the transparent orthographic structure of the language (Durgunoğlu & Öney, 1999, 2002; Öney & Durgunoğlu, 1997; Peynircioğlu, Durgunoğlu & Öney, 2002; Raman, 2006; Raman & Weekes, 2005; Raman, Baluch & Besner, 2004). In Turkish, which has a highly transparent orthography, each letter corresponds to one unique sound; in other words, there is a one-to-one relationship between orthography and phonetics, so readers can understand more easily grapheme-to-phoneme relationships and syllables constructed in different ways. These studies also indicate that during the early period of reading education, readers of Turkish gain word-decoding skills faster than readers of opaque orthographies. Studies (Durgunoğlu & Öney, 1999, 2002; Öney & Durgunoğlu, 1997; Raman, 2006; Raman, et al., 2004) underline that in other languages, such as English, which has an opaque orthography, the same letter combinations can be vocalized differently in different words (e.g., cat, call, car). Therefore, readers of these languages are more reliant on sound and syllable-awareness skills during the word-decoding process than readers of Turkish are. In line with this opinion, much of the research states that readers of transparent orthographies have adequate syllable-awareness skills and can decode the words more effectively than readers of opaque orthographies, and as a result

they can read more fluently (Durgunoğlu & Öney, 1999, 2002; Öney & Durgunoğlu, 1997; Peynircioğlu, et al., 2002; Raman, 2006; Raman & Weekes, 2005; Raman, et al., 2004).

Finally, when all the above-mentioned information is considered collectively, it is obvious that syllable awareness is an important skill in the word-decoding process, particularly in transparent orthographies such as Turkish. In the relevant literature, despite an abundance of research that analyses this subject, the matter is usually tackled within the context of early literacy skills that should be gained before learning to read. Therefore, this skill is usually assessed within the language skills that are gained at an early stage. It is also observed that it is only in a limited number of studies that the relationships between the syllable-awareness skills of students who read in Turkish and their word-decoding performance are described. This situation leads to the fact that findings from international studies in the literature are used as the basis of analyses, when describing the problems of students who have difficulty with word-decoding skills in Turkish, and in the development of appropriate intervention programmes to alleviate these problems. However, it is obvious that the problems readers encounter in a language like Turkish, which has a completely transparent orthography, cannot be fully explained by findings using languages that have an opaque orthography. When considered from this point of view, new and further research is needed, both to fill this important gap in the national literature and to define the relationships between syllable-awareness skills and word-decoding skills of readers in a highly transparent orthography such as Turkish. In line with these factors, this study aims to make a detailed analysis of the syllable-awareness skills of students who read in Turkish and their word-reading performances. We are of the opinion that findings obtained from this study will provide important contributions to an explanation of the difficulties that students experience in their word-decoding skills, as well as to the development of effective intervention programmes to prevent these problems.

Hypotheses

To shed light on whether poor syllable-awareness skills explain the word-reading performance failures of students reading in a highly transparent orthography, we tested three basic hypotheses.

Hypothesis 1. Overall, students would be faster and be more accurate in the processing of real words than in the case of pseudo words.

Hypothesis 2. Students with poor syllable-awareness skills would process both real words and pseudo words more slowly and less accurately than students possessing proficient syllable-awareness skills.

Hypothesis 3. Differences between the two groups would be more prominent with regard to the processing of pseudo words than with regard to the processing of real words.

Method

Participants

The participants were 90 second-grade students who attended a primary school that is affiliated with the Ministry of National Education and located in the Cankaya district of Ankara. When choosing the primary school for the research, particular attention was paid to selecting a school with individuals from average socio-economic backgrounds and which had at least three classes for second graders. Accordingly, a school with four classes of second graders (2a-2b-2c-2d) and an average of 30 students in each class was chosen. When forming the study group, factors such as the students' grade level, age, gender, educational background and whether they had been diagnosed as having specific learning

disabilities were taken into account. To this end, meetings were held with classroom teachers and counsellor teachers of the second-grade students. Later, files of all students were analysed under the teachers' guidance and 90 of them were selected for this study. These students were of the same age, had similar educational backgrounds (all received preschool education), had similar academic performances (all were academically average students in their classes), had gained word-reading skills, had not been diagnosed as having specific learning disabilities and had a balanced gender distribution (Table 1).

In order to determine the composition of the study groups, participants were divided into two groups with respect to their syllable-awareness skills as "students with poor or proficient syllable awareness skills." In order to separate the students into two groups comprising those with poor or proficient syllable-awareness skills, the 90 participants' error averages (which were obtained from the Syllable Awareness Skills Assessment Paradigm) were analysed using K-Means Cluster Analysis. As a result, 40 students were separated into the "proficient syllable awareness" group and 50 students were put into the "poor syllable awareness" group, as shown in Table 1. All the analyses used to construct the study groups, and the results obtained from these analyses, have been presented in detail in the "Findings" section.

Table 1. *Distribution of the Research Groups With Respect To Their Syllable-Awareness Skills and Gender*

| Groups | Gender | | Total | Age Range |
|--------------|--------|------|-------|---------------|
| | Female | Male | | |
| *Proficient | 18 | 22 | 40 | |
| **Poor | 23 | 27 | 50 | 6y 2m – 6y 5m |
| Total | 41 | 49 | 90 | |

Note: * Proficient; students with proficient syllable awareness skills

**Poor; students with poor syllable awareness skills

Instruments

In this study, three different computer paradigms were developed to determine the effect of students' syllable-awareness skills on their word-reading performances. These are: a) the syllable-awareness skills assessment paradigm, b) the real-word reading skills assessment paradigm and c) the pseudo-word reading skills assessment paradigm.

In the implementation of these developed paradigms, the DMASTR (DMDX) (DMASTR; developed at Monash University and at the University of Arizona by K. I. Forster and J. C. Forster; <http://www.u.arizona.edu/~kforster/dmastr/dmastr.htm>) computer program was used. This program automatically records the timing and accuracy of the participants' responses and allows for analysis of the responses after implementation.

a) Syllable-awareness skills assessment paradigm

In this study, a computer paradigm that was developed by the researcher was used to assess the students' syllable-awareness skills. In this paradigm, students were presented with words that were either correctly or incorrectly syllabified on the computer screen, and they were asked to decide whether or not these syllabifications were correct (see Figure 1).

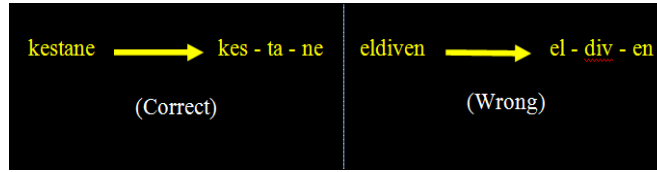


Figure 1. Computer Screen Views of the Syllable-Awareness Skills Assessment Paradigm

During the development phase of the paradigm, three basic stages were taken into consideration. These were: a) determining the words that would be included in the paradigm, b) the linguistic characteristics of these words (number of syllables, word type, printer font, etc. and c) compliance of the determined words with the syllabic structure of the Turkish language.

When we consider the words used in this paradigm, we see that a total of 42 words were used. Of these 42 words, 21 are real words whereas the other 21 are pseudo words. When developing the paradigm, first of all, the meaningful words that were to be part of the paradigm were determined. Later, the letters in these real words were switched around and new pseudo words were derived from them (e.g., “eldiven” is a real word, and “denilev” is a meaningless string of letters derived from it). All the real words in the paradigm were chosen as words that are familiar and simple to understand for students at their level of education. In choosing the words, textbooks and reading books compatible with the students’ age were used as the base material.

After the words that would be used in the paradigm were determined, these words were then assessed from the perspective of their linguistic characteristics. After the assessments, it was observed that all the real words in the paradigm are nouns, that they have similar distributions with respect to the number of syllables that they have and that their print fonts were similar to the fonts being used in schools. All the real words used in this paradigm were determined differently with respect to the number of syllables that they have, such as words with one, two, three and four syllables (Table 2). The pseudo words derived from these words, however, were constructed with syllabic structures and numbers of syllables similar to those of real words. To illustrate the process with an example, for the real word “kes-ta-ne” in the paradigm, “tek-na-se,” a pseudo word, was derived. The newly derived pseudo word is similar to the original, real word in terms of the number of syllables (both have three syllables) and in terms of syllabic structures (vowel and consonant combinations of syllables are similar in both words).

When the syllabic structures of the words in the paradigm are analysed, it can be seen that all the words comply with Turkish language’s syllabic structures; in terms of syllabic variety, they include all the syllabic structures within the Turkish language. When we look at syllabic structures in Turkish, with respect to the number of sounds that form the syllable and the place of these sounds in the syllables, it can be seen that syllables can be formed in six different ways (V, V+C, V+C+C, C+V, C+V+C and C+V+C+C). While the first three can make up the first syllable of the word, the other three can be placed at the beginning, middle or end of the word (Banguoglu, 1986). In this study, during the determination process for the test items that have different syllabic structures, all the above-mentioned syllabic structures were taken into consideration, and it was a precondition that all the syllables of the words used in the paradigm belonged definitively to one of these syllabic structures.

Table 2. *Distribution of the Items With Respect To the Word Type and Syllable Length*

| Syllable length | Real words | | Pseudo words | | Total n |
|-----------------|------------|----------------------|--------------|----------------------|------------|
| | n | Examples | n | Examples | |
| Monosyllable | 3 | (E.g.: kol) | 3 | (E.g: lok) | 6 |
| Bisyllabic | 6 | (E.g: o-da) | 6 | (E.g: a-do) | 12 |
| Trisyllabic | 6 | (E.g: o-to-büs) | 6 | (E.g: o-bü-tos) | 12 |
| Four syllabic | 6 | (E.g: te-le-viz-yon) | 6 | (E.g: ze-ye-vin-lot) | 12 |
| Total | | 21 | | 21 | 42 |

b) Real- and pseudo-word reading-skills assessment paradigms

In this study, two computerized paradigms were developed by the researcher in order to assess students' word-reading skills of real and pseudo words. In the paradigms, students were presented with two words and asked to decide as fast as possible whether the two words that they saw on the computer screen were the same or different. The only difference between the two paradigms is that in the former one, students were presented with real-word pairs, while in the latter one they were presented with pseudo-word pairs (see Figure 2).

| | |
|--|--|
| <p>sandalye sandalye (Same)</p> | <p>yasnelda yasnelda (Same)</p> |
| <p>sandalye teleskop (Different)</p> | <p>yasnelda pekeltos (Different)</p> |

Figure 2. Computer Screen Views for Real and Pseudo- Word Reading-Skills Assessment Paradigms

In the development of the paradigms, three fundamental criteria were taken into account: a) All the words used in the paradigms were words that were determined in the previous syllable-awareness paradigm, b) the two words in the word pairs formed by different words had a similar number of letters and syllables and c) one of the words in each word pair was written in printed letters, while the other word was hand written.

All the word pairs used in the real- and pseudo-word reading-skills assessment paradigms comprise real and pseudo words that were determined in the previous paradigm. In both paradigms, there are 42 word pairs: 21 of which are made up of the same two words while the other 21 are formed by two different words (see Table 3).

Another point paid attention to during the determination of word pairs was that the two words in the word pairs formed by different words should have similar letters and a similar number of syllables. By way of example, as in the case of forming real- and pseudo-word pairs such as "sandalye – teleskop" (a real-word pair) or "yasnelda – pekeltos" (a pseudo-word pair), both of the two words forming the pair are made up of eight letters and three syllables. Besides this, while one word in the pair is presented to students in printed letters, the other word is presented in handwriting. The reason for this is to prevent the students from making their same/different decisions about word pairs that have similar letters and numbers of syllables based only on their perceptions (at the visual/perceptual level), and taking it a step further, to facilitate use of their word-

decoding skills (Kargın et al., 2011, 2014; Güldenoğlu, Kargın & Miller, 2012; Miller, et al., 2012; Miller, 2004a, 2004b, 2005, 2006a, 2006b).

Table 3. *Distribution of the Words With Respect to the Word Type and Syllable Length*

| Syllable length | n | Real words | | Pseudo words | |
|-----------------|----|---|----|---|----|
| | | Examples | n | Examples | n |
| Monosyllabic | 6 | kol - kol | ✓* | lok - lok | ✓* |
| Bisyllabic | 12 | kedi - erik | X* | dike - ekir | X* |
| Trisyllabic | 12 | sandalye - sandalye | ✓* | yasnelda - yasnelda | ✓* |
| Four syllabic | 12 | televizyon - bilgisayar | X* | zeyevinlot - basliyigar | ✓* |
| Total | | 42 item | | 42 item | |
| | | (21 of them same- 21 of them different) | | (21 of them same- 21 of them different) | |

Note: ✓*: Two words are same
X*: Two words are different

Validity and Reliability

In this study, a content validity assessment has been made for the validity analysis of the paradigms that were used to assess students' syllable-awareness and word-reading skills. Likewise, for the reliability analysis, the Kuder Richardson Coefficient of Reliability (KR20) has been employed.

During the determination of content validity, explanations regarding the purpose of paradigms, their content and how they are implemented were sent to three Turkish-language teachers who work at two different primary schools in Ankara, and to two university scholars who have conducted research on Turkish language education and reading. Opinions of the assessors were gathered regarding whether the developed paradigms were fit for purpose, their method of implementation and the adequacy of the syllable and word structures used in the paradigms from the perspective of linguistics (number of syllables, syllabic structure, word type, letter font, etc.). The experts were asked to make an evaluation about the content and understandability of the paradigms by using a five-point scale (1: Not suitable at all, to 5: Very suitable) and they were also asked to express their opinions, if any, on how the paradigms could be improved. Subsequently, averages, standard deviations and coefficients of variations of the points that the experts gave to each aspect were calculated for every item in the paradigms. Accordingly, it was decided to include in the paradigms the items whose averages were greater than 4.25, standard deviation was less than 1.00 and coefficient of variation was less than 25%; the paradigms were then given their final forms. As a result of the evaluations, it was maintained that the paradigms were fit for purpose, that their implementation would be easy and practical and that, from a linguistics perspective, all the syllable and word structures used in the paradigms were suitable for the purpose of the study.

The reliability analyses of the paradigms used in this study were made by calculating the KR20 coefficient of reliability. As a result of these calculations, .85, .86 and .81 coefficients of reliability have been obtained for the syllable-awareness skills-assessment paradigm, the real-word reading-skills assessment paradigm and the pseudo-word reading-skills assessment paradigm, respectively.

Procedure

Pilot study. In this study, before switching to the data-gathering process for the main study, a pilot study was conducted with a group of students who had characteristics similar to those of the main study's sample. The pilot study was conducted individually in a designated environment at the same school where the main study was conducted, with

15 students who were not in the research group of the current study. In this pilot study, the objective was to receive feedback about the understandability of the items and instructions used in the paradigms, the length of application time and the usage of the developed computer program by the students. The pilot study revealed that all the items and instructions used in the paradigms were clear to all the students, that the assessments held the attention of the students thanks to the computer program used and that the duration of the test was approximately 10 to 15 minutes.

Main study. All the data pertaining to the main study were gathered through 10–15 minute individual sessions in a vacant classroom in the students' own school. In these sessions, first, the syllable-awareness assessment paradigm that was used in determination of the study group was applied. Subsequently, the real-word and pseudo-word reading skills assessment paradigms were implemented with individual students. Prior to implementation, conversations were held with all the students individually and they were told briefly about the purpose and content of the application. After these short conversations, implementation was carried out only with the students who volunteered to join the study.

While implementing each of the paradigms, three basic stages were followed; these were the explanation, training and test stages. In the explanation stage, which is the first part of the implementation, the experimenter explained the purpose of the relevant paradigm to the students and, by answering two sample items other than the real test questions; he demonstrated a model for them. While serving as a model, the experimenter asked the students to follow him and pay attention to how he handled the implementation. In the second stage, students were asked to do the training implementation that comprised eight sample items, excluding test items, on the computer. Meanwhile, the experimenter watched the students and provided help when needed. After the training stage, and upon a declaration by the student that they were ready, the test stage began. In this stage, students were asked to complete the paradigms independently and as quickly as possible. At the beginning of each paradigm, students were told that if they thought they had made a mistake then they should continue until they reached the end of the paradigm without stopping. Then, the test stage was started.

In this study, all the paradigms that were applied to determine the participant groups' syllable-awareness skills and word-reading performances were computer-aided paradigms. Through this computer program, the responses of students to questions within the paradigms were automatically recorded in terms of speed and error rates. In assessing syllable-awareness skills, students were asked to press the keyboard's "right tab" when they thought that the word they saw on the screen was syllabicated accurately, and to press the "left tab" when they thought that it was syllabicated inaccurately. In the assessment of their real and pseudo-word reading skills, however, students were asked to press the "right tab" when they thought that the word pairs they saw on the screen were the same, and to press the "left tab" when they thought they were different. In order to ensure that these two keys were easily distinguished from other keys on the keyboard, one of the keys was painted with a green "✓" mark while the other was painted with a red "✗" mark.

Results

Determining the research groups

In order to determine the make-up of the research groups, the error rates of the students gathered from the syllable-awareness skills assessment paradigm were analysed using the K-Means Clustering Method, and the results are presented in Table 4.

Table 4. Distribution of the Research Groups With Respect to Their Syllable-Awareness Skills

| Groups | N | M (mean) | Sd | Min. | Max. | p |
|------------|----|----------|------|-------|-------|------|
| Proficient | 40 | 8.62 | 3.53 | 2.00 | 14.00 | .000 |
| Poor | 50 | 20.68 | 4.16 | 15.00 | 36.00 | |
| Total | 90 | 15.27 | 7.13 | 2.00 | 36.00 | |

As can be seen in Table 4, students that participated in the study were separated into two groups with respect to the error rates they received according to the syllable-awareness skills assessment paradigm, as students with poor ($n= 50$) and proficient ($n= 40$) syllable-awareness skills.

Word -Reading Performance of Students with Poor and Proficient Syllable Awareness Skills

In order to compare the research groups' word-reading performances, two MANOVAs were conducted, computing the research group (students with poor and proficient syllable-awareness skills) as the between-subject factor, and the level of processing (LoP) (real and pseudo-words) as the within-subject factor. The mean scores of participants' word-reading performances, with reference to reaction times and error rates are presented in Table 5.

Table 5. MANOVA Results Regarding to Word- Reading Performances of the Research Groups

| Variables | Reaction times | | | Error rates | | |
|---|----------------|---------------|--------------|--|---------------|--------------|
| | F | p | η^2 | F | p | η^2 |
| LoP | 29.74 | .00* | .25 | 26.65 | .00* | .22 |
| Groups | 8.55 | .00* | .08 | 16.22 | .00* | .15 |
| LoP * | 2.89 | .09 | .03 | .02 | .86 | .00 |
| Groups | | | | | | |
| Means scores of real words | | | | Means scores of pseudo words | | |
| Groups | N | Reaction time | Error rate | N | Reaction time | Error rate |
| Proficient | 40 | 81 (13) | 4.62 (4.06) | 40 | 91 (16) | 7.30 (4.21) |
| Poor | 50 | 92 (15) | 9.02 (6.48) | 50 | 98 (17) | 11.52 (6.53) |
| Total | 90 | 87 (15) | 7.06 (5.93) | 90 | 95 (17) | 9.64 (5.97) |
| Means scores of overall word reading | | | | Means scores of lexicality effect | | |
| Groups | N | Reaction time | Error rate | N | Reaction time | Error rate |
| Proficient | 40 | 86 (13) | 5.96 (3.57) | 40 | 10.25 (13) | 2.67 (4.21) |
| Poor | 50 | 95 (15) | 10.27 (5.96) | 50 | 5.37 (14) | 2.50 (5.24) |
| Total | 90 | 91 (15) | 8.35 (5.45) | 90 | 7.54 (14) | 2.57 (4.78) |

Note: * $p < .05$

Reaction times were in milliseconds.

The main effect of LoP was statistically significant for both reaction times ($F_{(1,88)}=29.74$, $p < .05$, $\eta^2=.25$) and error rates ($F_{(1,88)}= 26.65$, $p < .05$, $\eta^2=.22$), suggesting that participants processed real word stimulus pairs significantly faster and more accurate than pseudo ones (Table 5). The main effect of groups was also statistically significant for both reaction times ($F_{(1,88)}= 8.55$, $p < .05$, $\eta^2=.08$) and error rates ($F_{(1,88)}=16.22$, $p < .05$, $\eta^2=.15$), indicating that overall students with proficient syllable awareness skills processed written words significantly faster and more accurate than students with poor syllable awareness skills. The interaction between LoP and research groups was statistically not significant for both reaction times ($F_{(1,88)}=2.89$, $p > .05$, $\eta^2=.03$) and error rates ($F_{(1,88)}=02$, $p > .05$, $\eta^2=.00$),

suggesting that the error rates and reaction times differences between the two participant groups were similar for both real and pseudo word reading performances (Table 5).

In order to clarify possible reaction-time and error-rate differences between the research groups under both real- and pseudo-word conditions, we conducted two One-Way analyses, one of which compared the participants' performances under real-word conditions and the other under pseudo-word conditions. The mean scores of participants' real- and pseudo-word reading performances with reference to reaction times and error rates are presented in Table 6.

Table 6. ANOVA Results Regarding to Real and Pseudo- Word- Reading Performances of the Research Groups

| Groups | N | Real words (Reaction times) | | | N | Pseudo words (Reaction times) | | |
|------------|----|-----------------------------|-------|------|----|-------------------------------|-------|------|
| | | M (sd) | F | p | | M (sd) | F | p |
| Proficient | 40 | 81 (13) | 13.56 | .00* | 40 | 91 (16) | 3.12 | .08 |
| Poor | 50 | 92 (15) | | | 50 | 98 (17) | | |
| Groups | N | Real words (Error rates) | | | N | Pseudo words (Error rates) | | |
| | | M (sd) | F | p | | M (sd) | F | p |
| Proficient | 40 | 4.62 (4) | 13.95 | .00* | 40 | 7.30 (4) | 12.49 | .00* |
| Poor | 50 | 9.02 (6) | | | 50 | 11.52 (6) | | |

Not: * $p < .05$

Reaction times were in milliseconds.

In error rates analyses, the between group effect was statistically highly significant suggesting that students with proficient syllable awareness skills processed real and pseudo word pairs significantly more accurate, ($F_{(1,89)} = 13.95, p < .05, F_{(1,89)} = 12.49, p < .05$, respectively). However, in reaction times analyses, the between group effect was only statistically significant for real words ($F_{(1,89)} = 13.56, p < .05$) but not for pseudo words ($F_{(1,89)} = 3.12, p > .05$), indicating that students with proficient syllable awareness skills processed only real words significantly faster than students with poor syllable awareness skills.

Discussion

The aim of this study was to determine the effects of syllable awareness on the word-reading skills of students reading in a highly transparent orthography. In line with this general purpose, 90 students with both poor and proficient syllable-awareness skills were included in the study, and their word-reading performances have been analysed according to three fundamental hypotheses.

According to the first hypothesis, we hypothesized that, overall, students would be faster and more accurate in the processing of real words than pseudo words. Findings regarding this hypothesis confirmed it and that, overall, students read the real words faster and more accurately than they did pseudo words. Evidence obtained from this hypothesis can be explained according to two basic issues. One is the decoding strategies that the students used during the word-processing paradigms, and the other is the word types that they encounter in these paradigms.

Decoding is defined as the ability to apply your knowledge of letter-sound relationships, including knowledge of letter patterns, in order to correctly pronounce written words. When word-reading theories are analysed, it is seen that readers decode the words using two principal strategies, depending on their competencies in phonology and orthography (Frost, 2006; Jackson & Coltheart, 2001). In the Phonological Decoding Strategy according to which awareness of the phonological structure of words is at the core of the word-reading process, readers first decode the phonemes in the words, and

then combine them in a proper and meaningful way. The Orthographic Processing Strategy, on the other hand, mediates word recognition via detailed orthographic representations that are stored in a permanent orthographic lexicon in which readers first process the words that they encounter as mental images using their permanent orthographic knowledge (representations). Later, they define the words by associating these words with their counterparts within their own phonological lexicons. Studies point out that readers do not know whether or not the encountered word is familiar, that they begin processing it along both routes simultaneously. However, it is the direct orthographic route — which is considered to be faster — that normally identifies the meaning of the word (Güldenöglü, et al., 2012; Kargin et al., 2011, 2014; Jackson & Coltheart, 2001; Miller, et al., 2012; Miller, 2005, 2006a, 2006b). When all this information is considered together, the results obtained with regard to the first hypothesis of this study can be interpreted in two different ways. As a first explanation, it is possible to say that, while participants were processing real and pseudo words, they might have used two different strategies (phonological and orthographical) depending on the types of words they encountered. To be more precise, the fact that all the words in the real-word paradigm were simple and familiar to the students makes us think that they might have used the orthographic processing strategy in that paradigm. However, the fact that they did not have any prior information in their phonological lexicons for the pseudo words leads us to think that they might have used phonological decoding strategies in that paradigm. In addition, when the reaction times of the students in these paradigms are taken into account, the fact that they spent more time using phonological decoding strategies when pseudo words were decoded also supports the idea that they might use two different processing strategies while processing the words. At first glance, it can be considered that this explanation is more suitable for both areas of usage for the decoding strategies in question, and for the processing that the students performed during the word-decoding procedure. From this point of view, it can be stated that students showing better performances in the case of real words rather than pseudo words, with respect to reaction times and error rates, is an expected outcome.

On the other hand, it is emphasized that readers achieve their orthographic processing levels only as a result of attaining a certain level of mastery in reading experience (Jackson & Coltheart, 2001; Paap & Noel, 1991; Therrien, 2004). Therefore, the fact that the participants were second graders, and that they received education in a sound-based sentence method during their reading education, might have left their reading skills within the influence of sound-based decoding strategies and prevented them from rising to the level of orthographic processing. When the obtained results are evaluated from this perspective, it can be considered that participants of this research might have used a decoding strategy based on phonological foundations in either of the word types (real or pseudo words). Likewise, it can be stated that students might have had greater difficulties in decoding the pseudo words that are made up of letter sequences that do not have a corresponding meaning in the Turkish language, as compared to decoding real words in their phonological lexicons. However, because of the contents and features of the paradigms, it is obvious that by looking only at the results obtained from this hypothesis, it is not possible to reach clear judgements about exactly which strategy/strategies these participants used while processing the two types of words. Therefore, in order to determine participants' word-decoding strategies and obtain clearer information about their performance for both types of words, participants were divided into two groups with respect to their syllable-awareness levels in the second hypothesis, and their performance for both types of words has been comparatively analysed.

Firstly, when the findings of the study are looked at from the perspective of real words, it can be seen that this hypothesis is confirmed; students with proficient syllable-

awareness skills to process real words faster and more accurately than students with poor syllable-awareness skills. In line with evidence obtained from this hypothesis, we are of the opinion that this finding is important for determination of the decoding strategy/strategies that the students used in word reading. More explicitly, if students had used the orthographic processing strategy in the real-word reading paradigm, as mentioned in the first hypothesis, then both groups would have needed to demonstrate similar performances, independently of any syllable-awareness skills they might possess. It should be noted that in word decoding in which the orthographic processing strategy is used, students will not need to resort to phonological processing and, therefore, their syllable-awareness skill levels will not come into play. However, when the results from this study are analysed, the fact that there are significant differences between the two groups leads to the consideration that, in this paradigm, they used a decoding strategy that was different from the orthographic processing strategy. Word-reading theories state that, when decoding words, readers can use a phonological decoding strategy rather than an orthographic processing strategy. It is also known that the ability to use this strategy, which emphasizes phonemic organizations of the word, changes in direct proportion to the extent of the reader's phonological knowledge and information. Because the Turkish language has a highly transparent orthographic structure (due to a one-to-one relationship between graphemes and their corresponding phonemes), it is considered that syllable awareness is one of the most important predictors of phonological decoding in Turkish (Durgunoğlu & Öney, 1999, 2002; Öney & Durgunoğlu, 1997; Öney & Goldman, 1984). Irrespective of word type (real or pseudo words), if readers analyse the syllabic structures of words in an appropriate way, then they can process the words correctly. When the above-mentioned effects of syllable-awareness skills on word reading are considered, we think that all the participants used their syllable-awareness skills within a real-word reading paradigm. As a result of this, students' real-word reading performances varied proportionately with respect to their syllable-awareness levels. This situation is important in that it shows the positive contributions that students' syllable-awareness skills made to their real-word reading performances.

When the findings pertaining to the second hypothesis of the study are looked at from the perspective of pseudo words, it can be observed that this hypothesis was partially confirmed and that students with proficient syllable-awareness skills read the pseudo words more accurately but also at a speed similar to that of students with poor syllable-awareness skills. The literature points to the fact that, during the decoding of pseudo words, readers must use the phonological decoding strategy because they do not have any orthographic information pertaining to these words within their phonological lexicons (Jackson & Coltheart, 2001; Vaughn, et al., 2003). From this point of view, although all the pseudo words used in the study were constructed in compliance with the Turkish language's syllabic structures, it is possible to say that participants needed some phonological decoding processing when decoding these words, as they were composed of letter sequences with no corresponding meaning in Turkish. When we consider that syllable awareness is a skill that lies at the centre of phonological decoding, it can be stated that students' syllable-awareness skills have an effect on their pseudo-word reading performances. When we analyse means of the pseudo-word reading performances of the two participant groups, we see that the results support this opinion and that the performance of the two groups in this paradigm vary in direct proportion to their syllable-awareness levels. This outcome shows that as the students' syllable-awareness skills increase, they are better at analysing and processing the pseudo words in this paradigm. In a direct proportion, when we look at the last hypothesis, we see that it is not confirmed by the results. It has been observed that word-reading performance differences in both types of words were similar for students with both poor and proficient syllable-awareness

skills. These outcomes also support the opinion that participants used their existing syllable-awareness skills in the decoding of both types of words. When analysing reading-performance differences that participant groups showed for both word-reading paradigms, it can be seen that students decoded real and pseudo words using their syllable-awareness skills and, as a result of this, their syllable-awareness levels had similar effects on both types of words.

In conclusion, when all the information presented above is considered together, it is clear that syllable-awareness skills have a positive effect on the word-decoding process in transparent orthographies. Outcomes of this study emphasize two important points in general. First, is the effect of syllable awareness on transparent orthographies; the other is the effect of this skill on the reading intervention programmes that can be provided to students who have limitations in the word-decoding process. The fact that syllables, which are formed by a single vowel or combination of different letters in a language like Turkish, which has a transparent orthography, are vocalized similarly in all words, regardless of their places in the words or the letters with which they are associated, leads to the opinion that syllable-awareness skills play a more important role in the word-decoding process of transparent orthographies than in that of opaque ones. We think that the differences observed between participant groups' word-reading skills can be a guiding light for reading intervention programmes that may be developed, particularly for students who experience limitations in fluent word decoding during the process of reading. From this point forward, based on the outcomes of this study, it will be appropriate to present a few suggestions to teachers. First, it is important that, during the teaching of reading, teachers objectively define the syllable-awareness levels of the students who experience difficulty in the word-decoding process, and then that they should provide appropriate interventions in order to develop them. In this process, in order to enhance the syllable-awareness skills of students who experience difficulties in word decoding; teachers should explain that words are made up of different combinations of syllables. Then they should present to students the words that are formed by as many different syllabic types as possible, and provide examples showing how they should analyse the syllabic structures. It is important to repeat the exercises frequently in order for the students to recognize the different syllabic types that make up words, and to accurately decode and analyse them. We think that as a result of all these applications, students will have enhanced their syllable-awareness skills, that they will be able to decode words more fluently and accurately, and that this will yield both fluent reading and increased comprehension.

This study has some limitations that should be made known to its readers. First, this is the first study on this subject in the Turkish literature, and it is limited by its testing of 90 students. Therefore, we believe that repeating this research with larger sample sizes and including students from different grades with different characteristics will enhance the generalizability of the findings. Second, outcomes of this research are bounded by students' reading performances at the lexical level. Therefore, we think that subsequent research that evaluates students' reading comprehension performances will be important for the development of new and effective reading intervention programmes in transparent orthographies.



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