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Effectiveness of Computer-Based Linguistic Games on Semantic and Phonological Awareness of Students with Dyslexia

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ABSTRACT

Dyslexia is one of the neurodevelopmental disorders with interdisciplinary dimensions. The study aimed to evaluate the effectiveness of computer-based Linguistic Games on semantic and phonological awareness of students with dyslexia. The study adopted a quasi-experimental design using pretest-posttest and a control group. The population of the study included all male students in the second grade with dyslexia, who were studying in the centers of learning disabilities in Mashhad- Iran. The research sample consisted of 20 students selected via convenient sampling method. The participants in the experimental group received 10 sessions of 45 minutes for training through the CBLG while the participants in the control group received the conventional training of learning disabilities in the centers. Language Development Test (TOLD-P3) was used in the pre-test and post-test to assess the semantic and phonological awareness of the students. The results of covariance (ANCOVA) showed that there was a significant difference between the mean scores of phonological ($P< 0.05$) and semantic ($p< 0.001$) awareness of the experimental and control groups. According to the findings, it became clear that training using educational linguistic games software package was more effective than conventional methods concerning the performance of semantic and phonological awareness.

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Introduction

The ability to read makes students familiar with new ideas and information in order to learn better ways of thinking and living (Bahadorikhosroshahi et al., 2022). However, dyslexic students still have difficulty in learning reading skills; although they have normal intelligence and appropriate educational opportunities, and lack emotional disabilities (Sleeman, 2021). For dyslexic students, there is a significant difference between their current level of reading skills and the expected level of their chronological and intellectual age and their school grade (Snowling & Hulme, 2011). According to the research results in the literature, reading disorder is the highest frequency in male students in the first and second grade of elementary school (Eskandari et al., 2021; Sadeghi et al., 2022; Talebi Tadi & Aghaei, 2021; Zijlstra et al., 2021).

To date, computer-assisted instruction has facilitated the learning process with respect to reading disorder (Ranjbar et al., 2020). In this sense, computer-based training provides some conditions for the students who are reluctant to participate in reading activities and are less motivated to learn due to failure in reading skills (Council III et al., 2019; Gharaibeh & Dukmak, 2021).

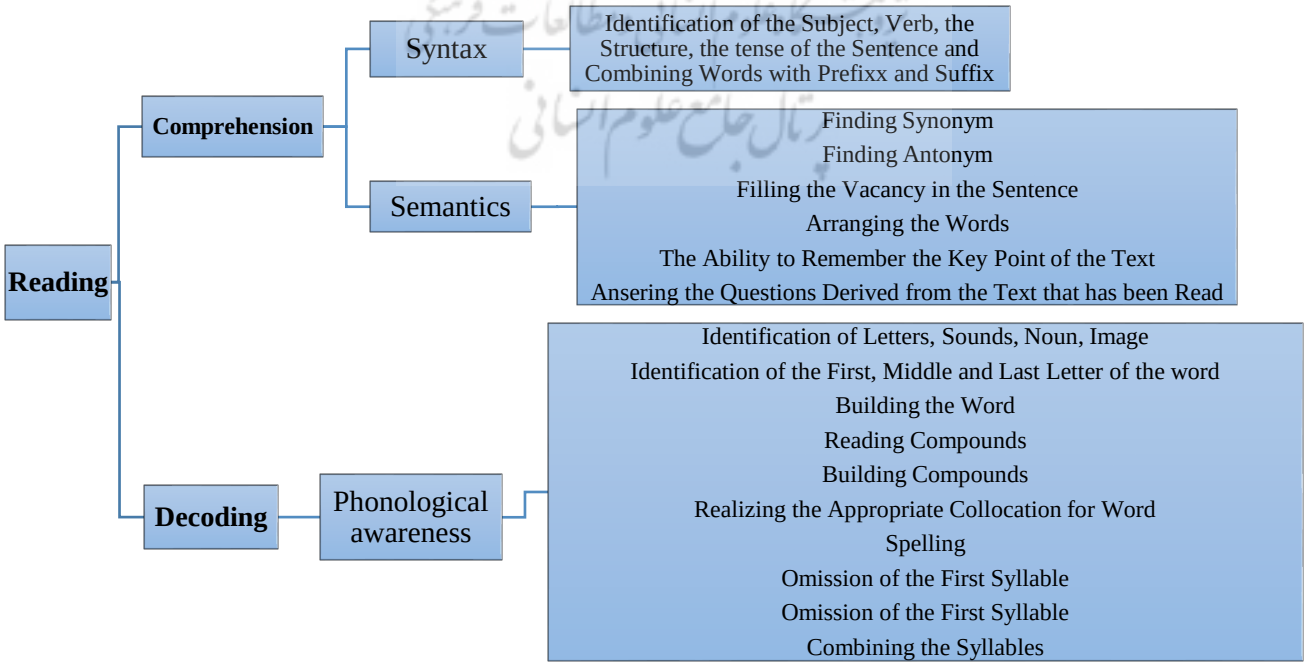
Considering the importance and effectiveness of computer-based instruction for students with reading disorder, a large number of various research have been done in the field; however, the educational software used in this research has not been frequently and widely used for the students with reading disorder in particular. Therefore, this study aimed to design and build software linguistic games appropriate to the cognitive features of the students with reading disorder, and then evaluate its effectiveness on improving the students' semantic and phonological awareness and comprehension.

Linguistic Components of Reading

Today, most experts believe that the main components of reading include decoding and comprehending; for instance, Gough and Tunmer (1986) have represented this in a simple view of reading as "reading equals comprehending decoding" (Hallahan et al., 2011) (see Figure 1).

In support of this reading approach, Sleeman (2021) studied and reviewed the components of decoding and comprehending with focus on both normal students and students having reading disorder. They found that the best way to intervene in special education to improve reading skills is a program in which the improvement and strengthening of both components of reading (i.e. decoding and comprehending) are included. The mastery of phonological skills plays an important role in the better performance of decoding (Jamshidifarsani et al., 2019) whereas promoting metalinguistic capabilities such as syntax and semantics is very effective in comprehending what students decode (Hallahan et al., 2011).

Figure 1.
Linguistic Components and Subcomponents of Reading



Phonological Awareness

Phonological awareness involves recognizing the letters, remembering their sounds, blending the letters and sounds, reading compositions, making the word, spelling, and knowing the reading instructions Halahan et al. (2011) and Milankov et al. (2021) introduced phonological awareness as an essential skill in spelling, which is the best predictor of the reading skills as well. In a study conducted by Latifi and Yaghobi (2019), it was found that there was a mutual relationship between phonological awareness and reading ability; in other words, first reading ability influences phonological awareness, and then gradually reading proficiency of students affects their phonological awareness. Therefore, students who cannot acquire phonological skills have main difficulty in reading and spelling [16]. Similarly, many researchers have referred to learning and the mastery of phonological awareness as the key to success in learning how to read (Benway et al. 2021; Vender, & Melloni, 2021).

Semantic

Semantics is the study of the meaning of words and sentences. Semantic skills enable the audience to realize the concept of the text based on the context of Semantic clues likewise facilitate the decoding process (Hallahan et al., 2011). Having knowledge without words, understanding without expression, the inability to name pictures, the weakness in describing a word or referring to the differences and similarities between sentences are all the drawbacks of a low range of lexicon along with pronunciation mistakes. This may then lead to poor performance in semantics, and consequently in complete and/or sometimes even incorrect comprehension of the text (Arjmandnia & Maleki, 2018; Dong et al., 2021).

The effect of improved semantic level on reading performance of the students has been investigated in many different studies. The results of a study conducted to find a link between semantic and phonological awareness and reading comprehension and fluent reading showed that phonological speed affects fluent reading while the semantic speed influences the speed of comprehension (Arjmandnia & Maleki, 2018). In another research, Dong et al. (2021) indicated that the impact of semantic assignments on fluent reading of the fourth-grade students is more than spelling exercises.

Cognitive Dysfunction in Students with Dyslexia

Research conducted on cognitive functions in children with dyslexia has shown that these students may suffer from inefficiency and dysfunction in short-term memory and working memory (Naji et al., 2020; Rezaei & Sharifi, 2020; Talebi Tadi & Aghaei, 2021), recovery of long-term memory (Montgomery et al., 2021), auditory processing (Aghaie et al., 2018; Duke & Cartwright, 2021), visual processing (Lancaster et al., 2021; Vernet et al., 2021), and regulation of attention (Greenwood et al., 2021; Khazaei et al., 2019). However, the students with dyslexia comprise a heterogeneous group whose members have different characteristics, whereas they all do not show all symptoms of dysfunction and are thus only inefficient in some cases (Omidvar, 2011). With this in mind, recognition of this dysfunction along with its impact on the students' learning process in terms of their reading difficulties seems to be necessary. This is due to the fact that disregarding any of these shortcomings would disrupt the students' educational process, and they fail to adequately exploit the proper training available to them and their treatment period may thus become longer (Asgharinekah et al., 2013).

The Role of Computer Games in teaching the skill of Reading

Chen et al. (2021) studied computer-based training in an article review; they analyzed 146 articles published between 1991 and 2020 in terms of structure, teaching method, and design and implementation and concluded that computer games are mostly used in transferring e knowledge and learning concepts. In this study, the role of computer games was recognized as a tool for facilitating learning, enhancing the ability to solve problems, and creating a pleasant and effective environment for students. In addition, Rajabiyan et al. (2020) stated that students pay more attention to the rules, tips, and feedback to the software while they are engaging in computer activities. In another study, Juhani Lyytinen et al. (2021) studied the role of computer-based learning in spelling skills in both normal students and students with reading dyslexia. Their research report stated that students with dyslexia significantly benefit from the software to increase the scope of their attention and their phonological awareness. In another line of research, Fadaei et al. (2022) aimed to teach using a "sequential display of letters" method with the help of digital media in order to show its effects on reading achievement of the elementary students. They found that teaching with multimedia is more effective than traditional methods in the students' reading ability in terms of reading correctly, reading rapidly, and storing more lexicons.

Designing a Linguistic Game Software for Students with Dyslexia

Researcher-made training packages are already designed and manufactured using the *Macromedia Flash CS6* software based on the clinical experience of researchers. These packages are also consulted with computer science professionals. This application includes 10 training and recovery sessions of 45 minutes for students with reading dyslexia. Relying on

the reading components to strengthen cognitive functions, the students who are accompanied with the therapist, get involved in linguistic games and carry out phonological and semantic activities.

Designing Linguistic-Games Based on Reading Components

According to the Computer-Based linguistic games (CBLG), students deal with finding the first, middle, and the last letter of words, building words, realizing compound words, and determining the syllables of words in sessions 1 through 6 in the first stage in order to improve their phonological awareness (see Figure 2 in Appendix 1).

In phase 2, students are engaged in activities such as sentence completion with a word, sentence completion with an image, riddles, building sentences, choosing the appropriate verb and subject for a sentence in order to strengthen their semantic awareness (see Figure 3 in Appendix 1). However, educational planning of the software changes from session 7 to 10 so that in the first stage in which interpretation and comprehension are emphasized, image reading, hearing stories, video questions, and building a sentence using the words of the story can help dyslexic students to read the story aloud and answer the questions derived from it (see Figure 4 in Appendix 1).

In the second stage, the students use the vocabularies they have heard in the story or somewhere else to get involved in the following activities to complete their phonological awareness, including the accuracy of identification and isolation of the letters with similar form and sound (see Figure 5 in Appendix 1). Per session, the students perform 20 linguistic activities in the form of entertainment in a coherent and relevant context.

At the end of each stage, a profile of student performance, including the number of questions, correct and incorrect answers, unanswered questions, time spent on activities in minute, and student success percentage are calculated by software and are then shown on the monitor screen. An expert also records the results in the form of a 'student performance report'. This information can be used as feedback for the expert and students, which helps them to compare their progress following the previous sessions. Finally, the task sheet of the same session appears after selecting the button 'to do at home'. This information sheet includes information about class activities and complementary exercises for fixing the materials thought in the class (see Figure 6 in Appendix 1).

To select the images, words and sentences, the books of "Let's read" and" Let's write" as well as the first-grade teaching aids are used; the stories of the software are selected from the storybook of "Tales of my dad and I". The choice of words, sentences, and stories are carefully coordinated with the training materials budgeted for each session. At the end of each stage, the results and scores are represented through the software, and are recorded on a sheet of paper reporting the students' performance. In addition, the therapist records a descriptive report of the weaknesses, strengths, and areas needed more practice in a report sheet. At the end of each session, a homework sheet is designed through the educational content of the session, which explains how they should be done and what cases should be emphasized further.

The Development of Software Strategies for Cognitive Dysfunctions of Dyslexic Students

As mentioned earlier in the section of cognitive dysfunction of dyslexic students, it is possible that the students suffer from some shortcomings in areas such as short-term memory, working memory, recovery of long-term memory, auditory processing, visual processing, and attention regulation. Therefore, it is necessary to develop some cognitive strategies to overcome or redress the shortcomings when making educational software for students with reading dyslexia. To strengthen cognitive functions in children with reading problems, the software takes the measures introduced in the following sections.

Short-Term Memory and Working Memory:

- Instructions are presented in a simple and short form.
- Hidden icons and texts are used for operation buttons (Figure 7 in Appendix 1).
- For more proficiency in one skill, diverse activities of the skill are offered.
- Correct answers and feedback to the student performance are observed immediately after the activity (Figure 7).
- Game instruction is played as an audio file at the top of the screen (Figure 7).
- When a new concept is introduced, attractive graphic pages related to that concept are designed.

Recovery of Long-Term Memory:

- An opportunity is provided to try again in response to an activity (Figure 8 in Appendix 1).
- To remind a word, different methods (image with word, image without words, words without images) are used.
- Used words and phrases are in proportion to the age of the group of students.

Auditory Processing:

- Instruction is clear.
- The speaker observes the audio stresses in his/her intonation.

- It is possible for the player to hear the instruction as many times as he/she wishes (Figure 9 in Appendix 1).

Visual Processing:

- Images are displayed with perfect resolution.
- Instructions, options and operation buttons are all arranged on a simple and unambiguous screen.
- A consistent design template is followed as the main activities are displayed in the middle of the screen and control buttons are at the bottom.
- To avoid the student's confusion, a limited number of colors are used.
- There is a significant difference between the background and text color.
- Black is used for the text while red is used for highlighting the key points (Figure 9 in Appendix 1).

Regulation of Attention

- A penguin at the top corner of screen shows the student's scores (Figure 10 in Appendix 1).
- A happy dummy at the bottom of each page shows the number of correct answers (Figure 10).
- A sad dummy at the bottom of each page shows the number of incorrect answers (Figure 10).
- Number of games can be seen at the top left-hand corner of the screen (Figure 10).
- A questioning dummy shows the number of questions at each stage at the end of the stage (Figure 11 in Appendix 1).
- A happy dummy shows the number of correct answers at every stage at the end of the stage (Figure 11).
- A sad dummy shows the number of incorrect answers at each stage at the end of the stage (Figure 11).
- A Sleepy dummy shows the number of unanswered questions at each stage at the end of the stage (Figure 11).
- The player can see his progress percentage at the end of each stage (Figure 11).
- Students can be aware of the amount of elapsed time at the end of each stage (Figure 11).
- The important points in the text are highlighted in red (Figure 9).

Method

Participants

The present study adopted a pre-test-posttest quasi-experimental research design, including the control group and experimental group. The population includes all male students in the second grade of elementary school with reading disabilities, who were studying at the learning disabilities centers of Mashhad. However, it should be noted that at first the students were introduced by teachers based on the current assessment and diagnostic process of learning at the centers, then they were evaluated by the Wechsler Intelligence Scale (Wechsler, 1969) (Shahim, 1994), *Bender* Visual-*Motor Gestalt Test*, Frostig Test. Moreover, their background and reading status were investigated in the presence of experts at the centers to diagnose students with dyslexia. The sample of the present study is composed of 20 students as such, who were selected by convenient sampling with their parents' consent from the centers in districts 3 and 6 of Mashhad, and they were divided into two groups of 10 students, the experimental and control groups.

Instruments

a. Demographic Information Questionnaire

A researcher-made questionnaire was used to obtain some demographic and personal information on the participants involved through the educational profile of the students and their parents.

b. The Revised Version of Wechsler Intelligence Scale for Children

In order to ensure that there is not any difference in the intellectual ability of participants, the Wechsler Intelligence Scale for Children was used for both groups. The scale is developed by Wechsler (1969) (Shahim, 1994) to measure children's intelligence, including 12 subscales (6 verbal subscales and 6 non-verbal subscales). The split-half reliability of the test was reported to be .97 for overall IQ, .97 for verbal IQ, and .93 for practical IQ (Marnat, 2000). In this study, the standardized Persian version of this questionnaire was used [38] to measure the intelligence of 6 to13 year-old children. The split-half reliability of the test was reported to be .94, .90, .96 for general intelligence, verbal intelligence and nonverbal intelligence, respectively. The correlation of the test with academic achievement was reported to be .88 with the reliability of .85.

c. Language Development TOLD-P3 Test

One of the valid tools assessing language development of students is *Test of Language Development TOLD-P3*, which is standardized and translated into Farsi by Hassanzadeh and Minayie (2002) is used in this study to measure the semantic and phonological awareness at pre-test and post-test. The high coefficients indicate that the test has little error, and that the results can be reliable. Given the content validity of the test, the developers of the original test emphasize that the items used in the subtests have been selected based on other similar valid and reliable tests that have been frequently

used for decades successfully, which implies their validity in this way (Hassanzadeh, & Minayie, 2002).

Results

In reporting the results of the survey, the descriptive data related to the intelligence status and reading components of participants are firstly examined and some inferential analyses are done to compare the groups as for the pretest and post-test. As shown in Table 1, the mean and standard deviation of verbal intelligence, practical intelligence, and overall IQ of the participants are measured through the revised version of the Wechsler Intelligence Scale for Children.

Table 1.
Mean, Standard Deviation (SD), and Participants in Both Groups

Variable	Group	Mean	SD
Verbal intelligence	Experimental	97.60	12.59
	Control	100.20	7.50
Practical intelligence	Experimental	107.20	14.36
	Control	100.30	7.16
Total IQ	Experimental	103.20	12.59
	Control	100.50	6.68

To determine if there is a significant difference between the experimental and control groups in terms of their mean scores of verbal intelligence, practical intelligence, and IQ, independent t test was used. According to the results of tests, which compared the two independent means, it can be concluded that there is no significant difference between the experimental and control groups in the average verbal intelligence ($p> 0.05$, $df =18$, $t= -0.561$), practical intelligence ($p> 0.05$, $df =18$, $t= 1.35$), and total IQ ($p> 0.05$, $df = 18$, $t=0.599$).

Table 2 represents the mean and standard deviation of phonological awareness in pre- and post-test for both the experimental and control groups. As can be seen, the mean of phonological awareness scores for the experimental group has increased from 15.52 in pre-test to 17.47 in posttest measurements. In addition, Table 2 shows the data related to the mean and standard deviation of semantics in pre-test and post-test for both the experimental and control. It can be observed that the mean of semantic scores for the experimental group has increased from 42.50 in pretest to 51.50 in post-test.

Table 2.
Means, Standard Deviation (SD) In Phonological Awareness and Semantics

Variable	Group	Pre-test		Post-test	
		Mean	SD	Mean	SD
Phonological Awareness	Experimental	15.52	5.52	17.47	3.54
	Control	11.75	6.11	12.80	5.70
Semantics	Experimental	42.50	11.26	51.50	8.20
	Control	39.80	5.53	39.10	6.96

To clarify whether the treatment was effective in improving phonological awareness, one-way analysis of covariance (ANCOVA) was used. To ensure that the variances were equal in implementing the analysis of covariance for the groups under study, the assumption of the homogeneity of variances was examined through Levene Test, and it was revealed that these assumptions were not met ($p<0.05$, $F= 1.30$). The interaction between the groups (i.e., experimental and control) and covariate (The pre-test score of reading accuracy) is significant at the 0.05 level. That is, the regression slope is not the same for both experimental and control groups and that this assumption has not been met ($p> 0.05$, $F= 1.38$).

In examining the data in Table 3, it can be seen that if we control the pre-test score, we can see that there is a significant difference (Eta squared=0.322, $P<0.05$, $F_{(1, 17)} =8.09$) between phonological scores of the experimental and control groups. Therefore, the software linguistic games leading to intervention is effective in improving the phonological skills of dyslexic students. Chi Eta also shows that 32% of changes in post-test scores are due to the intervention based on software linguistic games.

Table 3.
The Results of ANCOVA Comparing the Mean Scores of Two Groups' Phonological Awareness

The source of change	SS	df	Ms	F	P	2η
Pre-test score	238.39	1	238.39	7.90	0.012	0.318
Group	243.86	1	243.89	8.09	0.011	0.322
Error	512.40	17	30.14			
Total	46006	20				

* P < 0.001

In order to evaluate the effects of intervention in improving the semantics, ANCOVA was also used. Since one of the preconditions for implementing covariance method is to ensure equal variances in the study groups, the assumption of homogeneity of variances evaluated through Levene test showed that this assumption is met (P> 0.05, F=1.06). The interaction between the groups (experimental and control) and covariate (The pre-test comprehension) is significant at the level of 0.05. That is the regression slope for both experimental and control groups are not the same and this assumption has not been met (p>0.05, F=0.456).

As shown in Table 4, if we control pre-test score, we can see that there is a significant difference between the semantic scores (Eta squared = 0.544, p> 0.001, $F_{(1, 17)}$ = 20.26). Descriptive statistics of Table 3 show the mean scores of semantic skills in the experimental group (51.50) were higher than that of the control group 39.10 in semantic skills; therefore, the game-based intervention of the linguistic software was effective in improving the semantic skills of dyslexic students. The findings also show that 54% of changes result from the game-based intervention of the linguistic software.

Table 4.
The Results of Comparing the Mean Scores of Two Groups' Semantic Awareness

The source of change	SS	df	Ms	F	P	2η
Pre-test score	577.16	1	577.16	21.04	0.000	0.553
Group	555.57	1	555.57	20.26	0.000**	0.544
Error	466.23	17	27.42			
Total	428.54	20				

Discussion

This study aimed to evaluate the effects of the intervention of linguistic computer game on improving the Semantic and Phonological Awareness of students with reading disabilities. Having implemented CBLG special designed for dyslexia, the researchers initiated the intervention, which consisted of 10 sessions of 45 minutes for the experimental group and control group received only the common programs of learning disabilities center. The results showed that the overall intervention with the linguistic game software improves the phonological and semantics awareness of Persian-Speaking Students with Dyslexia. Therefore, the findings of this study show that phonological awareness and semantic awareness affect the dyslexia. The results of the study are also consistent with the results of the studies carried out by (Bagherpur & Ghajar, 2019; Milankov et al., 2021).

In similar longitudinal research, Jamshidifarsani et al. (2019) evaluated and compared the effect of a computer-based and traditional education on increasing phonological awareness, spelling, reading accuracy, and reading speed of the students with reading dyslexia. The results showed that the use of educational software in an intervention program is the most useful approach to meeting the objectives of the research while the least effective approach was the traditional education. The researchers believe that their findings show that computer-based instruction and the simultaneous use of voice and image for the recognition of phonemes and syllables is required for students with reading dyslexia.

Based on their findings, Alidoosti et al. (2021) emphasized that visual and auditory exercises are very effective in improving the effectiveness of training phonological intervention program for students with reading disabilities.

The theoretical evidence of research conducted by (Alipour et al., 2020; Ouherrou et al., 2019) show that

emotional variables not only simplify the process of education, but also make students more motivated to pay attention to the calling and recovering the information in learning situation in which the learner's cognitive capacity is limited. With this in mind, the researcher thus attempted to provide a learning environment in the form of attractive activities for the students with reading dyslexia in order to motivate the students to make progress during the game. In this way, the students desire to win, think and correct their mistakes, and finally to repeat and practice reading skills, and work more actively by the end of the session through the motivation of a new game.

As for the semantic ability, it is expected that the students can find synonyms, antonyms, and hyponyms for the words, understand the meaning of a sentence based on the meaning of words, phrases, and signs of the sentence, and be able to express with other words what he has been understood. Understanding a math problem or the meaning of a poem and a story are examples of semantic skills, so the possession of a wider range of words helps the students to obtain more semantic capabilities (Baranji et al., 2021). Hearing correct words, knowing the correct spellings of words, storing them in memory, and using them in appropriate situations are prerequisites for predicting the semantic skills of the students. In the configuration of software linguistic game, the researcher created a space to improve the semantic skills of the students through strengthening the prerequisites. At the stage of phonological awareness, the students try to become familiar with the written form along with pronunciation and image of the word, and remember them in order to use them again at the next stage while successfully achieving more scores during the semantic game.

Playing with phonemes, syllables, and several sign combinations through hearing, seeing, reading words, seeing, and naming pictures in the linguistic software helps students to learn the phonological knowledge more meaningfully. Filling the vacancy with having images, solving riddles, and choosing the words can improve the semantic level of the students. In fact, the use of e-learning content in education provides a condition through which the narrative, images, words, and animations can be combined with each other, which leads to an increase in attention span, the creation of fun and happiness, the improvement of retention and memory function, the growth of learning, and finally reminding the vocabularies for the students with reading disabilities.

A recent study (Gharaibeh & Dukmak, 2021) demonstrated that the use of software leads to an active communicative interaction among the students in the learning context, which then makes it possible to assume the students responsible for their own learning. Using the software, students also act upon their own appropriate speed and receive positive feedback immediately after the proper response or negative feedback following the correction of wrong answers. This makes the students interact with the software and focus on the game without distraction. The expert next to the student creates an environment where learning increases with the survival of the user's attention and participation in the activities. Furthermore, the assessment offered at the end of each training session is very effective in encouraging the cooperation and supervision of parents and in strengthening the students' positive self-concept.

Lestari and Thresia (2021) argued that students who experience difficulty in reading achieve the best results of the training while teaching the alphabetical encoding skills, having plenty of time to practice, getting feedback, and developing the skills and word recognition strategies are all combined in the teaching method. Software linguistic games make the students with reading dyslexia more motivated for learning due to the amusing repetition of phonological and semantic activities and a gradual increase in the level of education. Moreover, giving some assignments to the students to do at home leads to the review of educational materials and consequently to the strengthening of dyslexic students' memory.

Throughout the software development in the study, some interesting and important points were noticed and identified. First, since the computer-based educational games can make learning more interesting and encourage students to overcome obstacles to their learning, the games can teach them to solve their problems well. Hence, it is necessary that computer science professionals and experts pay more attention to the cognitive characteristics of students with reading dyslexia when designing educational software in order to come up with more effective software to improve the reading skills of students. Creativity and innovation in the software graphic design, the application of solutions to regulate students' attention, the application of policies to guide the student to control the speed of operation as well as establishing audiovisual communication with the computer program make the product even more attractive and effective. Second, computer-based education as a teaching aid tool along with the learning expert helps students with special needs to learn skills; however, it is not intended to replace the learning expert. Finally, it is necessary for the learning experts and teachers to provide opportunities to use new educational tools to improve the quality of special education. Furthermore, parents, teachers, counselors and theorists can take advantage of

the findings of the study to produce software specialized in special education which helps the students with reading dyslexia to overcome their reading problems.

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Conflicts of Interest

No conflicts of interest declared.

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Appendix 1.
Figures

Figure 2.
The First Stage of the Sample of Decoding Activities (Phonological Awareness):

a- Which word/s has the same initial and final letters? (damɑvand, kabɑb, qif, gorg)
b- Syllabifying the word (ɑ/ dam/ bar/ fi)

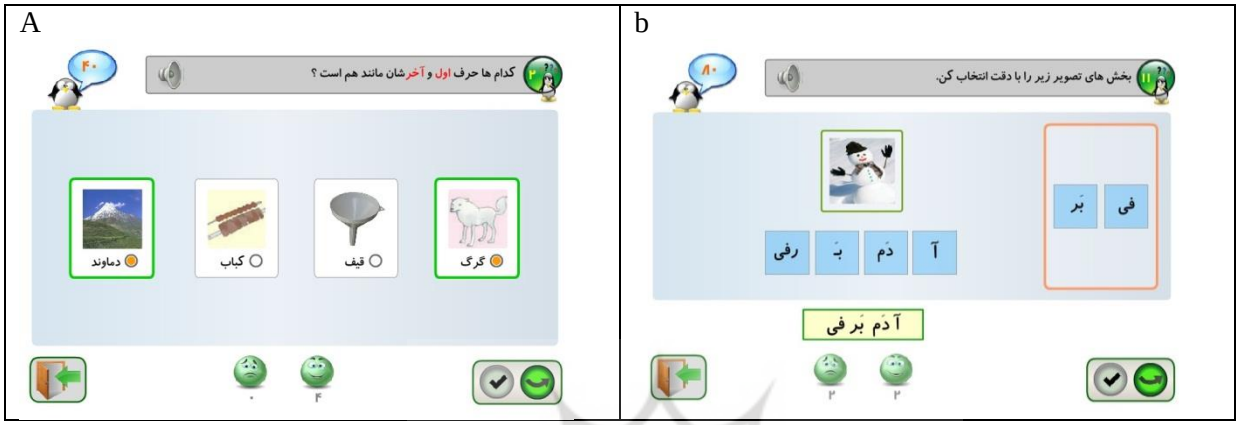

Figure 3.
The Second Stage of Comprehension (Semantics and Syntax):

a- Filling a blank in the sentence with the suitable word;
b- Identifying the verb of the sentence.

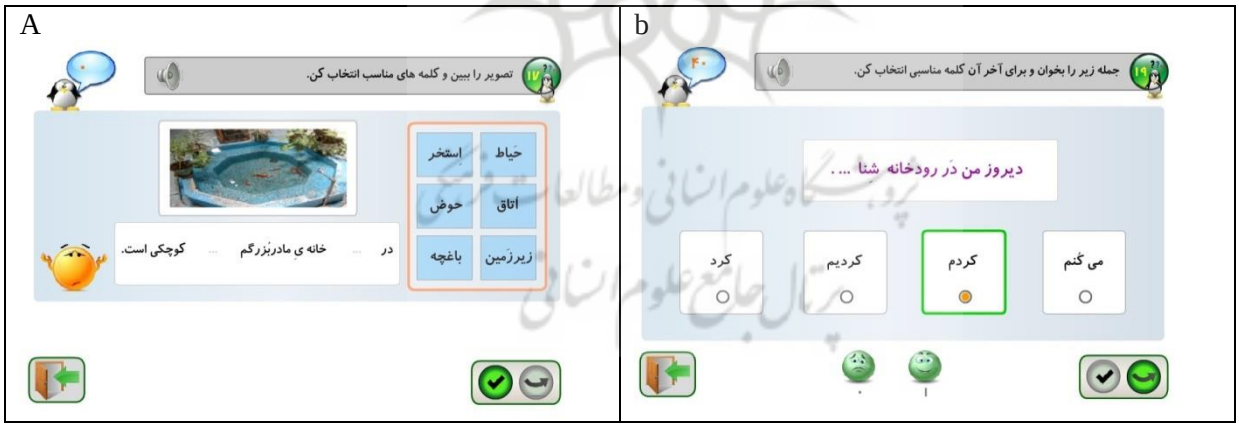

Figure 4.
The First Stage, Comprehension (Semantics and Syntax):

- **a-** Hearing the story,
- **b-** Hearing and reading the story

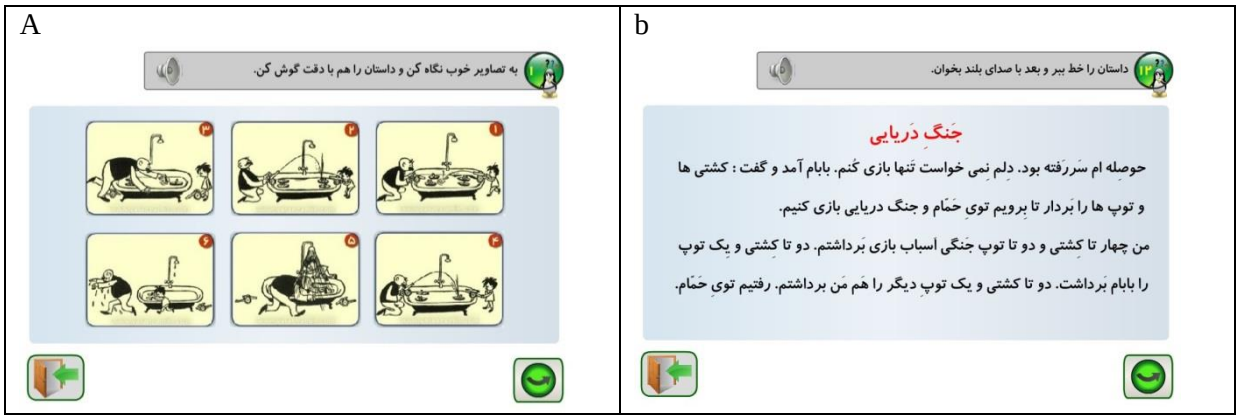

Figure 5.
The Second Phase of Decoding Activities (Phonological Awareness):

- a- Distinguishing letters from sounds (vaqt, jɑru, jəlo);
- b- Finding the appropriate letter in each word (saniə, baste, paiz).

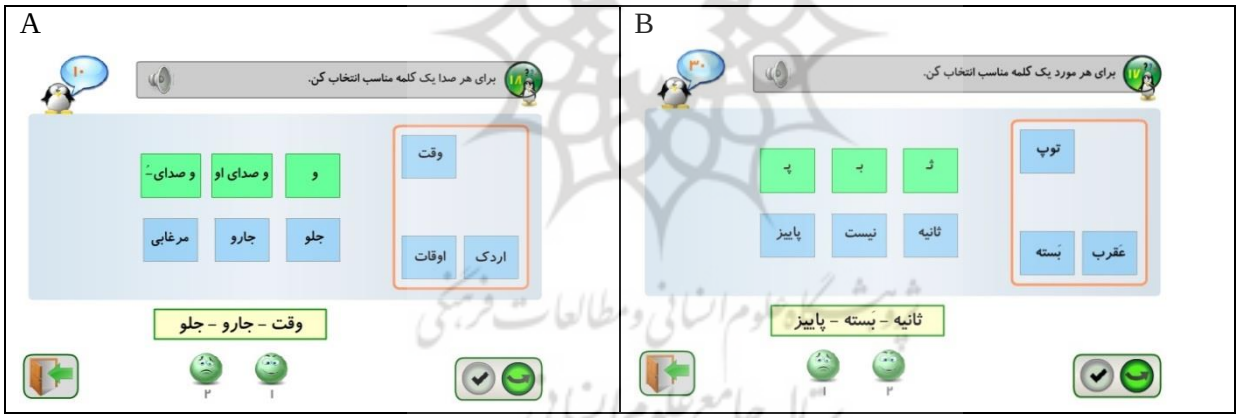

Figure 6.
Student's Performance Report:

a- sheet recording the student's performance report of the sessions he has worked with the software;
b- a sample of the paper 'to do at home'

Figure 7.
Audio playback of the game instruction showing the correct answer for the blank, happy and sad dummy for feedback to student's response, and icons for the operation buttons

Figure 8.
Try Again' Button (Look At the Picture and Make A Sentence with the Words)

Figure 9.
Black Used For the Text While Red Used For Highlighting the Key Points (Name of Which Fruit Is (Black) With One Period and With One Syllable (Red))

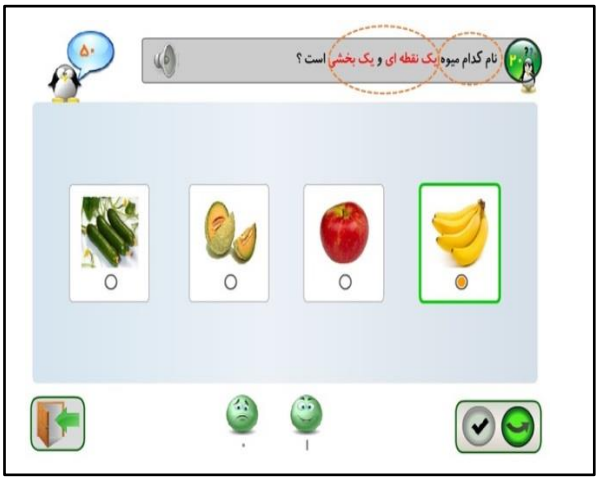

Figure 10.
A Penguin For Scores at the Upper Left-Hand Corner, A Penguin For The Number of the Game at the top Right Corner, A Happy Dummy for the Number of Correct Answers, and a Sad Dummy For The Number of Incorrect Answers (Choose A Suitable Word for the end of the Sentence)

Figure 11.
A Questioning Dummy For The Number Of Questions, A Happy Dummy For The Number Of Correct Answers, A Sad Dummy For The Number Of Incorrect Answers, A Sleepy Dummy For The Number Of Unanswered Questions, A Clock For Showing The Time Elapsed At That Stage, And A Progress Chart Showing The Success Percentage.