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Comparing the Effectiveness of Two Kinds of Reading Interventions on Reading Outcomes in Third to Fifth Grade Farsi Speaker Students with Dyslexia: An Exploratory Study

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Abstract

Background: This research marks the exploration into comparing the effectiveness of two reading interventions in improving reading outcomes for third to fifth-grade Farsi-speaking students with dyslexia.

Methods: In this randomized control trial study, twenty students in Tehran were randomly assigned to a multi-component group and a comprehension-based intervention group, each receiving 36 sessions of 45 minutes. The effectiveness of the interventions was evaluated using adjusted mean differences with a one-way ANCOVA.

Results: The results revealed the comprehension-based intervention's superior effect size across most outcomes, except for the letters string. The effect size was large for word reading 0.93 (CI -0.002 to 1.85), medium for phoneme deletion 0.67 (CI -0.23 to 1.5), small for text comprehension 0.25 (CI -0.62 to 1.13), and trivial for both rhyme identification 0.1 (-0.77 to 0.98) and non-word reading 0.11 (CI -0.76 to 0.98). The multi-component intervention had a greater effect size on letters string than the other intervention, although it was small -0.21 (CI -1.09 to 0.66).

Conclusion: The study concluded that comprehension-based intervention was more effective for Farsi-speaking students with dyslexia in grades 3-5, emphasizing the need for diverse intervention approaches to address their specific needs.

Keywords: Reading, Intervention, Farsi, Dyslexia, Multi-Component, Comprehension

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Introduction

Dyslexia, a hereditary neurodevelopmental disorder, poses significant challenges to individuals' reading and reading fluency abilities (1). The prevalence of dyslexia among monolingual Farsi-speaking Iranians has been reported to range between 1.2% and 10% (2), highlighting the need for targeted interventions to address the unique needs of this population.

Understanding effective reading interventions for dyslexia is of paramount importance to supporting individuals with this condition. When designing a reading intervention for students with dyslexia in grades three to five, some factors should be taken into account, for instance: (a) type of intervention, (b) orthography, and language (3). In the subsequent section, a detailed explanation of each factor will

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↑What is "already known" in this topic:
Employing a structured and inclusive method is vital for effective interventions. Research indicates the efficacy of multi-component interventions for individuals with reading challenges and dyslexia. Alternatively, interventions focusing on reading comprehension show promise for this group.

→What this article adds:
The manuscript integrates meta-analysis findings on reading interventions in Farsi with opaque orthography, suggesting comprehension-based strategies to improve reading skills for Farsi-speaking students aged 9-12 with dyslexia.

be presented.

Type of Intervention

The National Reading Panel's report in 2000 identified phonological awareness, phonics, reading fluency, vocabulary, and comprehension as key components for successful reading instruction (4). Phonological awareness is a metalinguistic ability that enables children to analyze the sound structure (5). In phonics instruction, students learn the alphabetic principle, the formation of the phoneme-grapheme connections necessary for reading and spelling. In an effective interventions in a broader literacy program for children with dyslexia, phonics instruction is combined with phonological awareness or other components involved in reading (6, 7). Reading fluency involves the capacity to read written text with suitable speed, accuracy, and prosody, as well as the ability to read aloud at a conversational level. (8). The interventions focused on improving reading fluency can yield positive outcomes in terms of both reading fluency and reading comprehension for students facing reading difficulties. (9). Reading comprehension is the act of understanding and interpreting written or spoken text (10). It involves constructing a mental representation of the meaning by considering different elements, including the language, structure, content, purpose, and characteristics of the text (11). The National Reading Panel (2000) identified two general headings for comprehension: vocabulary and comprehension strategies (4). Vocabulary pertains to an individual's lexical knowledge and individual's ability to understand, create, retain, and recall word meanings, whether through oral language or written text (12).

Using a structured and inclusive approach is crucial for effective interventions (13). On one hand, studies provide evidence supporting the effectiveness of multi-component interventions for individuals with reading difficulties and dyslexia (14). On the other hand, there is other evidence that suggests interventions specifically targeting reading comprehension instruction are more suitable for this particular group of individuals (15). Given the recommendation to compare multi-component interventions with single-component interventions (16) and considering that the ultimate goal of reading is to achieve reading comprehension (17), the exploration of the effectiveness of both multi-component intervention and comprehension-based intervention in grades three to five students with dyslexia was expected to yield novel and enhanced outcomes.

Orthography and Language

Research in diverse orthographic systems reveals common reading patterns influenced by orthographic consistency in languages (18). The Farsi orthography is considered opaque (or inconsistent) due to the presence of one-to-many and many-to-one correspondences between letters and phonemes and also the absence of some vowels (e.g.,/e/, / æ/, and /o/ in Farsi) in writing (19). The majority of dyslexia intervention studies have been conducted in English, which also has an opaque orthographic system. While there are similarities between English and Farsi languages in this particular aspect, the generalizability of research findings of reading interventions to other languages is limited. Hence, it is advised that studies investigating individual aspects of interventions should also be conducted in different languages (20). This study contributes to the knowledge base by examining two reading interventions in Farsi.

Intervention Dosage

Intervention dosage is another aspect of planning reading interventions. Increased intensity and longer duration are crucial for successful remediation, especially as the child's age increases and the impairment severity becomes more pronounced (21). Recent evidence from a meta-analysis study supports the significant role of intervention dosage (6). Taking into account previous research conducted in the Farsi language (22-24), this study included a longer duration of intervention. Also, it was held intensively three times a week.

Purpose of the Study

This exploratory study aimed to study the effectiveness of a new multi-component evidence-based reading intervention versus a new comprehension-based evidence-based reading intervention for students with Dyslexia in Farsi. The objective of the study was to assess the effects of these interventions on various reading-related outcomes. These outcomes include word reading, non-word reading, text comprehension, phonological awareness (specifically rhyme identification and phoneme deletion), and letter string recognition. Additionally, we analyzed changes in outcomes within each intervention group independently. This involved comparing baseline measurements collected before the intervention with the outcomes measurements after intervention in the aforementioned reading-related areas.

The aim of this exploratory study was to compare the effectiveness of two reading interventions designed for Farsi language students with dyslexia in improving reading outcomes. Additionally, we investigated the rate of changes in outcomes within each intervention group independently.

The specific research questions of this exploratory study were:

1) Which reading intervention designed for Farsi language students with dyslexia is more effective in improving reading outcomes?

2) What is the rate of changes in outcomes within each intervention group independently?

Methods

This randomized trial compared two reading interventions and was approved by the institutional review board of the Tehran University of Medical Sciences (TUMS). The study protocol with an a priori approach was registered in the Iranian Registry of Clinical Trials (IRCT) (IRCT20190504043467N1). The parents of each student provided informed consent before the intervention. Due to the Covid-19 outbreak, modifications were made. The sample size was reduced from 42 to 20 due to an extended data collection period (November 2020 to March 2023). The intervention format changed from small group to one-on-one sessions for safety reasons. About the effectiveness of

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small-group interventions compared to one-on-one interventions, some studies have indicated that there is no significant difference between the two approaches (14, 25). A total of 720 individual sessions were conducted for the 20 participants, totaling 540 hours.

Randomization

Randomization used the random block method with blocks of size four generated online. The first author assigned codes to participants, who were then allocated to interventions based on their codes.

Participants

The study focused on Farsi-speaking students with dyslexia in grades three to five (9 to 12 years old). Participants were selected from learning disability centers, children's hospitals, and public schools. Out of 40 students, 22 met the eligibility criteria. The criteria included being a native Farsi speaker, having an IQ score ≥ 85 on the Wechsler test, and having no sensory impairments or neurological, psychological, or psychiatric disorders. Eligible participants were randomly assigned to either the multi-component intervention (group one) or the comprehension-based intervention (group two). Out of the initial 22 participants, two sets of parents discontinued their involvement in the intervention. One parent withdrew after the 15th session of the comprehension-based group due to distance, while the other parent discontinued after the 18th session of the multi-component group due to unmet expectations. As a result, the study included 20 participants, 10 students in each group with an average age of 10 years, comprising 13 boys (65%). Ten students were in the third grade (50%), 6 in the fourth grade (30%), and 4 in the fifth grade (20%). The comprehension-based group had 8 boys (80%) and 2 girls (20%), with 6 students in the third grade (60%), 3 in the fourth grade (30%), and 1 in the fifth grade (10%). The multi-component group had 5 boys (50%), with 4 students in the third grade (40%), 3 in the fourth grade (30%), and 3 in the fifth grade (30%).

Procedure

After designing the interventions, the first author conducted interventions for all participants. Each eligible student was assigned a random code. Selected subtests from the Reading and Dyslexia Test (it is named NAMA in Farsi) (26) were utilized including word reading, non-word reading, rhyme identification, phoneme deletion, text comprehension, and letters string. These specific subtests were chosen because the majority of previous studies have considered them as primary outcomes in this age group in English (27).To maintain the integrity of the design, and due to blinding, another speech therapy Ph.D student who was blind to the intervention and was familiar with the NAMA test administered it to each student. The evaluator audio-recorded each of the evaluations. This assessment process was conducted twice - once before the intervention and again one week after the intervention. The audio recordings were then provided to the first author, who listened to them and recorded the scores for each subtest on an answer sheet using the student's assigned code. The answer sheet data were subsequently entered into an Excel file for further analysis. Importantly, the first author remained blind to the participants' test scores until the second assessment, and both the parents and students were unaware of the specific types of intervention being administered.

Measurement

NAMA Test

The NAMA test assesses reading and dyslexia in Farsi. It was standardized on a sample of students in grades 1-5 from elementary schools in Iran (28). The reliability of the test was reported to range from 0.43 to 0.98 across different subtests. The NAMA subtests utilized in this study had a total duration of one hour.

Interventions

In this study, the independent variables included two types of reading intervention. One group received the multi-component intervention, while the other group received the comprehension-based intervention both with 36 sessions lasting 45 minutes, thrice weekly.

Comprehension-based Intervention

This group focused on enhancing reading comprehension over 29 sessions using methods like anticipatory guidance, text analysis, and note-taking. Techniques included reading aloud, cloze texts, and comprehension questions. The final 7 sessions emphasized vocabulary skills through concept utilization, word definition maps, semantic relations exploration, and metalinguistic concepts.

Multi-Component Intervention

The intervention targeted reading skills, covering phonological awareness, alphabetic knowledge, fluency, vocabulary, and comprehension. It comprised two sections of 18 sessions each. The first section focused on phonological awareness and alphabetic knowledge, while the second section addressed fluency, vocabulary, and comprehension in sequence. The title of each session for both interventions is in Table 1.

Procedures for Interventions

The interventions were conducted in a well-lit room at the speech therapy clinic of the Rehabilitation Faculty of Tehran University of Medical Sciences. The room was free from noise and distractions, providing an optimal environment. It was equipped with a table, chairs, and a closet for storing necessary tools and materials. Content for these interventions was created using a variety of English resources from around the world that focused on reading, dyslexia, and learning disorders (29-31). The books were acquired from three libraries affiliated with the rehabilitation faculties of TUMS, Iran University Medical Sciences, and Rehabilitation and Social Health University. Various tools were utilized in each intervention, including printed lesson plans. The interventions incorporated Farsi language stimuli, ranging from syllables to different texts. In the multi-component intervention, specific tools were employed for different sections, such as colorful Legos, word cards, and

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Table 1. Title of Lesson Plans in Each Reading Intervention

Session	Multi-component intervention		Session	Comprehension-based intervention
	Phonological awareness part	Alphabetic knowledge part		
1	Word and phrase repetition	Multisensory techniques	1	Preparing for reading comprehension
2	Rhyme Identification and categorization		2	Before Reading Monitoring
3	Word onset/rhyme production,	Two-shape vowels and multi-shape letters	3	while Reading Monitoring
4	identification, and categorization		4	After Reading Monitoring
5	Syllabic segmentation, substitution,	Introducing clusters and consonant combinations	5	Anticipation guide
6	and deletion		6	Brainstorming
7		Phonograms	7	Answering to question
8	Phoneme combination, deletion,	Sight words	8	Know/ Want/ Learn
9	and substitution	Word recognition Introducing	9	Listing group/ Labeling/ prediction
10		word roots and affixes	10	Possible texts
11	Non-word segmentation		11	Reading aloud
12		Prefixes' teaching Suffixes teaching	12	Text recalling
13	Phonemic working memory	Visual and auditory memory	13	thought sheets
14		Making sentences Teaching	14	Cloze text
15		homophone and homograph	15	Note-taking strategy
16		Reading irregular words	16	Over-learning strategy
17	Rapid automatic naming	Reading high and low-frequency words	17	Chunking strategy
18		Syntax awareness	18	Learning strategy Introducing key points
	Reading fluency part	Reading comprehension part		
19	Fluent reading	Preparing for reading comprehension	19	Learning strategy: The student identifies the sequence of story events
20	Echo reading	Reading Monitoring	20	Narrative text comprehension
21	Paired reading		21	Story grammar
22	Choral reading		22	Teaching the types of expository text
23	Repeated reading	Brainstorming	23	Teaching cause-effect text
24	Reading aloud	Text recalling Answering to the question	24	Teaching problem-solving text
25	Reading speed adjustment	Know/ Want/ Learn (KWL)	25	Teaching sequencing text
26		Anticipation guide	26	Teaching comparative text
27	Story retelling	Before reading strategy	27	Using previous knowledge
28	Phrasing the text	after reading strategy	28	Special vocabulary
29	Reading unfamiliar words	Cloze text	29	Using content
	Vocabulary part			Vocabulary part
30	Special vocabulary	Narrative text comprehension	30	Special vocabulary
31	Using content		31	Using content
32	Definition word's map		32	Definition word's map
33	Semantic relationships	Teaching descriptive text	33	Semantic relationships
34		Teaching problem-solution text	34	Metalinguistic concepts
35	Metalinguistic concepts	Teaching sequence text	35	
36		Teaching comparative text	36	

picture cards for phonological awareness. For alphabet knowledge, plastic alphabet letters were used. Flash cards were utilized for reading fluency, while textbooks, storybooks, and relevant reading materials were employed for both reading fluency and comprehension. The comprehension-based intervention utilized graphic organizers and educational and non-educational books adapted to the age range of the students. Simple dictionaries and graphic organizers were used for vocabulary activities

A lesson plan was created for all sessions (72 sessions), outlining the title, objectives, instructions, materials, duration, and explanations. Table 1 displays the titles of specific contents included in both types of interventions. In the following, we will give a brief description of both interventions' processes.

Intervention Fidelity

The first author developed the interventions herself and implemented them based on pre-written lesson plans. Some sessions were recorded through video and audio for review

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by the corresponding author, ensuring the intervention was accurately implemented.

Analysis Design

Stata version 17 was used for all analyses in this study. To analyze the distribution of age, gender, and education among participants, Chi-square and Fisher's exact tests were utilized. To investigate the primary objective of comparing the effectiveness of two interventions on reading-related outcomes, a one-way ANCOVA was conducted, with baseline scores as the covariate. The assumptions of the ANOVA were evaluated using the Shapiro-Wilk test and Levin's test. For the secondary objective of the study, paired t-tests and Wilcoxon tests were employed to compare baseline scores and outcome scores within each group.

Results

The participant sampling and random allocation process, as well as the number of participants lost to follow-up, are presented in Figure 1 according to the CONSORT 2010 guidelines.

The Shapiro-Wilk test assessed the normality of the scores, with all scores except for word reading and non-word reading showing normality ($P > 0.05$). To address the non-normal distribution of word reading scores, the square data transformation method was applied using the G-ladder command in Stata software, which helped normalize the distribution. However, none of the data transformation methods resulted in a normal distribution for non-word reading scores. Therefore, the bootstrap method was used for this variable. Furthermore, Levine's test confirmed equal variances between groups, indicating homogeneity of variances for all scores ($P > 0.05$). Table 2 displays the result of Levin's test.

Comparison of Intervention Groups

The main findings of the study showed no significant differences between the two intervention groups for any of the outcomes.

The effect size was large for word reading 0.93 (-0.002-1.85), medium for phoneme deletion 0.67 (-0.23-1.5), small for text comprehension 0.25 (-0.62-1.13), and trivial for rhyme identification 0.1 (-0.77-0.98) and also for non-word reading 0.11 (-0.76-0.98) in favor of comprehension-based intervention group. The multi-component intervention had

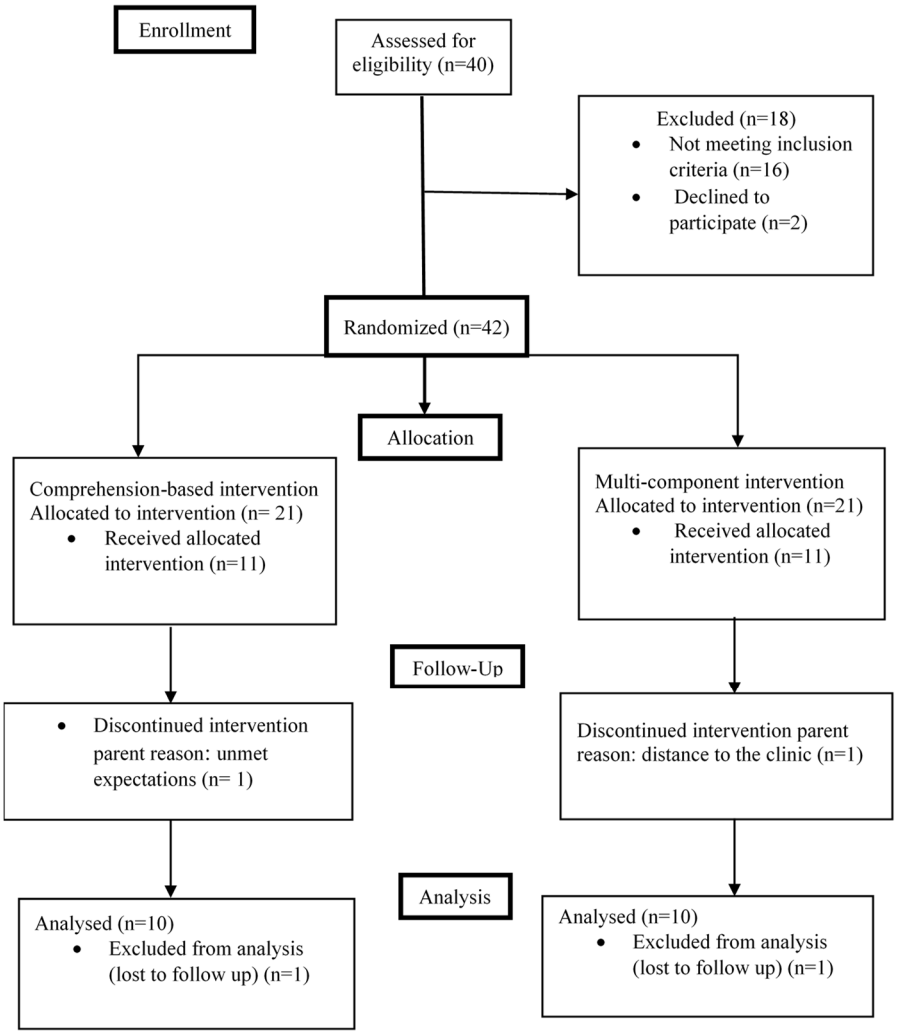

Figure 1. CONSORT 2010 Flow Diagram

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Table 2. Examining the assumption of homogeneity of variances

Outcomes (Max)	Intervention groups	Pre-intervention		Post-intervention	
		Mean (SD)	*P* value	Mean (SD)	*P* value
WR (120)	Multi-component	44.5 (27.45)	0.098	63 (25.63)	0.253
	Comprehension-based	81.2 (36.01)		98.7 (20.76)	
NWR (40)	Multi-component	11.3 (11.28)	0.790	20.1 (10.82)	0.413
	Comprehension-based	30.1 (9.99)		32.5 (8.38)	
TC (28)	Multi-component	9.4	0.206	10.9	0.088
	Comprehension-based	10.4		11.6	
RI (20)	Multi-component	4.1 (4.35)	0.267	7.5 (1.9)	0.081
	Comprehension-based	6.5 (2.95)		7.9 (3.34)	
PD (30)	Multi-component	3.9 (3.28)	0.275	6.3 (3.46)	0.651
	Comprehension-based	5.8 n(2.14)		9.9 (3.9)	
LS (53)	Multi-component	7.7 (2.54)	0.149	12.4 (4.58)	0.266
	Comprehension-based	7.2 (3.99)		11 (6.03)	

Note: maximum (Max), word reading (WR), square data transformation (sq), non-word reading (NWR), text comprehension (TC), rhyme identification (RI), phoneme deletion (PD) and letter string (LS), standard deviation (SD).

Table 3. Comparison of Two Reading Interventions Effects on Reading Outcomes: One-Way ANOVA Results and Effect Sizes

Outcomes (Max)	F	P	Adjusted Mean		Adjusted MD (CI 95%)	Adjusted SMD (CI 95%)
			Comprehension-based	Multi-component		
WR sq (120)	3.8	0.068	8606.23	6083.86	2522.36 (-207.94_5252.67)	0.93 (-0.002_1.85)
NWR (40)	0.05	0.831	26.79	25.8	0.98 (-8.56_10.52)	0.11 (-0.76_0.98)
TC (28)	0.33	0.572	11.44	11.05	0.38 (-1.03_1.81)	0.25 (-0.62_1.13)
RI (20)	0.05	0.820	7.85	7.54	0.3 (-2.48_3.09)	0.1 (-0.77_0.98)
PD (30)	2.02	0.173	9.04	7.15	1.88 (-0.91_4.67)	0.67 (-0.23_1.5)
LS (53)	0.24	0.631	11.32	12.07	- 0.75 (-3.99_2.49)	- 0.21 (-1.09_0.66)

Note. F-values (F), effect sizes mean difference (MD), and standardized mean difference (SMD). confidence interval (CI 95%), maximum (Max), word reading (WR), square data transformation (sq), non-word reading (NWR), text comprehension (TC), rhyme Identification (RI), phoneme deletion (PD) and letter string (LS). p value (α =0.05).

Table 4. Comparison of Baseline and Outcome Scores by Groups

Scores (Max)	Pre & post Intervention	Comprehension-based		Multi-component	
		Mean (SD)	*P* value	Mean (SD)	*P* value
WR (120) sq	Pre	7760.6 (5275.71)	0.051	2658.7 (3409.57)	0.005
	Post	10129.7(3500.77)		4560.4 (3659.60)	
NWR (40) W	Positive	6	0.505	11.3 (11.28)	0.010
	Negative	4		20.1 (10.82)	
TC (28)	Pre	10.4 (2.63)	0.199	9.4 (3.3)	0.066
	Post	11.6 (1.26)		10.9 (2.07)	
RI (20)	Pre	6.5 (2.95)	0.271	4.1 (4.35)	0.064
	Post	7.9 (3.34)		7.5 (1.9)	
PD (30)	Pre	5.8 (2.14)	0.002	3.9 (3.28)	0.007
	Post	9.9 (3.9)		6.3 (3.46)	
LS (53)	Pre	7.2 (3.99)	0.002	7.7 (2.54)	0.004
	Post	11 (6.03)		12.4 (4.85)	

Note: maximum (Max), word reading (WR), square data transformation (sq), non-word reading (NWR), text comprehension (TC), rhyme identification (RI), phoneme deletion (PD) and letter string (LS), standard deviation (SD). *P*-value is based on a paired t-test. For non-word reading Wilcoxan test was used (W).

a greater effect size on letters string than the other intervention, although it was small -0.21 (-1.09-0.66). Table 3 presents the F statistic, p-value, and adjusted means for both groups, as well as the adjusted mean difference and standardized mean difference with their corresponding confidence intervals.

The secondary analysis compared baseline and outcome scores within each intervention group using the paired t-test and Wilcoxon test (for non-word reading). In the multi-component intervention group, considerable changes were observed in all outcomes except for text comprehension and rhyme identification scores. In the comprehension-based intervention group, considerable changes were only seen in phoneme deletion and letter string scores. Table 4 presents the means of baseline and outcome scores, along with the corresponding p-values for each group.

Discussion

The main objective of this study was to determine the effectiveness of two reading interventions for Farsi language students with dyslexia in grades three to five on primary reading outcomes, such as word reading, non-word reading, text comprehension, rhyme identification, phoneme deletion, and letter string. The primary findings revealed that the comprehension-based intervention had larger effect sizes compared to the multi-component intervention in improving all outcomes, except for letters string. It is worth noting wide confidence intervals in this study complicate drawing definitive conclusions.

Children with dyslexia have greater difficulties in reading comprehension in opaque orthography compared to transparent orthographies (32). This finding has been found in English as well (3). Although, Galushka et al. contrary to this finding, have stated in their meta-analysis study that comprehension-based interventions in English do not

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yield a significant effect on improving reading skills, although they did not consider it as a definitive result due to the lack of evidence (20). The finding of the present study for comprehension interventions in Farsi with an opaque orthography is in agreement with an earlier research study, which shared relatively similar outcomes and content such as using background knowledge and stories, summarizing the story, etc (33).

The comprehension-based intervention's efficacy over the multi-component approach may be attributed to its focus on reading comprehension as the ultimate goal of reading development (17). As students progress through schooling, they transition from decoding challenges to extracting meaning from texts. Reading comprehension has a multifaceted nature (34-37). This intervention addresses various comprehension elements such as vocabulary knowledge, background knowledge, inferencing abilities, and other relevant skills and does not focus on decoding. This intervention endorsed the multidimensional perspective of reading comprehension and aligned with the needs of students in this age group and educational grades. This finding also makes sense when considering the opaque nature of Farsi orthography. Children with dyslexia in line with a simple view of reading (37) have greater difficulties in reading comprehension in opaque orthography compared to transparent orthography (32).

The second explanation is the comprehension-based intervention group had higher baseline word reading scores than the multi-component group. Even after adjusting for baseline scores, the comprehension-focused intervention was more effective, showing larger effect sizes in decoding-related outcomes. Older students with better word reading scores tend to perform better in reading comprehension outcomes (38, 27).

The final explanation concerns the duration of exposure to written text and student motivation (39). While not quantitatively measured, the first author observed implementation conditions, noting that the comprehension-based intervention involved close interaction, discussions, and personalized text selection to enhance comprehension and information integration. It seems by becoming familiar with the structure, type, and strategies of text, the students became more fluent in reading, which subsequently led to increased motivation. Existing literature has consistently documented a positive link between reading motivation and reading skills (40). Enhancing reading skills boosts self-worth, motivation, and participation, leading to improved reading achievement (27). In the multi-component intervention group, the conditions described earlier were implemented starting from the 18th session. Before that, for the first 18 sessions, the clinician sat across the table from the student and provided training.

The secondary objective was the rate of changes in outcomes within each intervention group independently. The results showed that the multi-component intervention group had a significant increase in outcome scores compared to baseline scores in word reading, non-word reading, phoneme deletion, and letter string. The comprehension-based group also had a considerable increase in outcome scores in phoneme deletion and letter string. The results are consistent with Fälth's study (41).

Study Limitations

This study's limitations include the absence of a non-intervention control group for more accurate comparison, no post-intervention follow-up measurements, a small sample size due to COVID-19 constraints, and the need for further examination despite reported increased motivation. These constraints should be considered when interpreting the results.

Conclusion

In conclusion, the study suggests that comprehension-based interventions are more effective for 9-12-year-old Farsi-speaking students with dyslexia.

Authors' Contributions

The first author designed, implemented, and wrote the interventions and study. The second author guided all study phases. The third author edited the content and the fourth provided statistical consultation.

Ethical Considerations

The study was conducted with ethical approval from Tehran University of Medical Sciences (IR.TUMS.FNM.REC.1398.111).

Acknowledgment

The authors thank all participants for their voluntary involvement and express special appreciation to those who consistently attended the clinic during the peak of the Corona outbreak. It is important to note that this unfunded research is associated with potential benefits linked to product development resulting from the study.

Conflict of Interests

The authors declare that they have no competing interests.

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