

**The role of spaced and massed instruction on Iranian EFL learners' reading comprehension and reading motivation****Article info****Article Type:**

Original Research

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Azarfam<sup>2</sup>Fatemeh Mirzapour<sup>3</sup>**Abstract**

Strong reading comprehension skills and reading motivation are essential for personal growth, academic success, and overall well-being. Developing these skills can positively impact individuals' lives in various ways. Thus, this investigation aimed to examine the influence of massed and spaced instructions on the reading comprehension and reading motivation of Iranian EFL students. The researchers selected 150 Iranian participants from 300 based on their Oxford Quick Placement Test (OQPT) performance. The selected intermediate participants were randomly assigned into two experimental groups (massed and spaced) and one control group. The participants were given a reading comprehension pretest and post-test and a reading motivation questionnaire before and after the treatment. Three groups were provided with instruction on reading skills by English texts and new words from American English File 3. The massed group received a 90-minute session for each text, whereas the spaced group received three 30-minute sessions; the first session lasted 30 minutes, followed by two more sessions, each lasting 30 minutes, scheduled two days apart. The results of data analysis utilizing one-way ANOVA showed a considerable difference between the post-tests of the spaced and massed groups compared to the control group. The findings demonstrated that the spaced group outperformed the massed and control groups ( $p < .05$ ) in terms of reading comprehension and reading motivation. The results have some pedagogical implications for English instructors, learners, and curriculum developers.

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## 1. Introduction

Reading has a crucial function in language learning, particularly for individuals who learn English as a foreign language. It is a paramount segment for improving L2 skills as it provides a primary platform and extensive source for engaging with the target language (Bánhegyi & Nagy, 2019; Nilforoushan et al., 2023). Additionally, reading aids students in expanding their comprehension of various linguistic aspects such as syntax, speech structure, and vocabulary. Some scholars assert that students fail to engage with their assigned textbooks despite effective education from their teachers (Masduqi, 2014). Conversely, others argue that students' reluctance to participate in reading exercises stems from a lack of understanding of the subject and text interpretation (Nilforoushan et al., 2024; Johan et al., 2022a). It is essential to mention that the recognition of the significance of reading abilities at all educational stages, along with their potential to provide favorable job prospects (Esfandiari & Hessani, 2019), have spurred our desire to comprehend the factors influencing students' reading comprehension, particularly in L2 contexts.

The ability to read is the ability of an individual to read, understand, interpret, and decode written language and text. Reading skills are also valuable in absorbing and responding to written communication (such as e-mail, notes, letters, and other written messages). In recent decades, there has been controversy about how effective reading is in learning English. Some consider reading as a dependent variable rather than an independent one (Kumar et al., 2015; Seifoori, 2024).

Komiyama (2013) emphasizes that L2 reading skill improvement is of utmost importance in engaging language learners in learning a second/foreign language. Competence in reading can also boost learners' motivation, which is a crucial factor in reading since it offers students the drive and inspiration they need to achieve their language learning goals and a range of commitments aimed at achieving language learning objectives (Meihami & Saadat, 2019; Namaziandost et al., 2020). The importance of motivation in encouraging learners to read cannot be overstated. Numerous studies have demonstrated that individuals with strong motivation to read are more inclined to exhibit techniques such as enthusiasm and a willingness to explore

different genres and styles of literature. Nakata (2015), analyzed distinct aspects of children's reading motivation and connection to essential reading skills and academic achievement. The results indicated that a strong motivation for reading is associated with increased engagement in reading-related activities, such as evaluating one's self-efficacy and tackling challenging texts.

Furthermore, the impact of enthusiasm for reading on reading development has been highlighted in several studies (Gashti, 2021; Rigg et al., 2020; Seifoori, 2023; Zwaan, 2012). Besides the inspiration to read, the other crucial factor that impacts students' reading motivation and ability is their reading proficiency (Jeon & Yamashita, 2014). Therefore, to enhance students' reading motivation in a foreign language, the current study's researchers conducted massed and spaced instruction in Iranian English as a Foreign Language (EFL) classrooms.

Massed instruction is a learning or study technique where information is presented continuously without breaks or intervals. In this approach, learners engage in a concentrated and uninterrupted practice of a particular task or skill. On the other hand, spaced instruction involves distributing learning sessions over time with intervals between each session. This technique allows learners to revisit the material at spaced intervals, reinforcing their memory and retention of the information. In summary, massed instruction involves intensive and continuous practice, while spaced instruction involves distributing practice sessions over time (Ebbinghaus, 2013).

## **2. Literature Review**

In 2013, Ebbinghaus put forth the theory known as the spacing effect, which suggests that knowledge is more effectively acquired and retained when revisited incrementally rather than through massed and uninterrupted study sessions. This phenomenon has been extensively studied and confirmed in various fields of learning. For instance, in mathematics it has been demonstrated that spaced repetition aids in recalling and retaining knowledge (Rohrer & Taylor, 2006). Furthermore, researchers have convincingly shown the impact of the spacing effect on children acquiring their first language vocabulary (Childers & Tomasello, 2002; Namaziandost et al., 2019). Additionally, studies have identified the impact of the spaced revision on remembering

intricate physical details and accurately reproducing images (Schuetze, 2015). It is worth noting that the spacing effect even extends to word processing, as research conducted by Rogers (2017) and Seabrook et al. (2005) has revealed its effectiveness in this domain positively.

Many researchers, such as Bregman (1967) and Hintzman (1976), have acknowledged that consistent intervals between learning sessions can have long-term benefits in experimental processes. This view has led to the development of precise theories, particularly in the 1970s, to either confirm this explanation explicitly or emphasize the need to consider specific components in all four language skills (Miles, 2014). Some researchers have examined relevant empirical evidence and theoretical explanations regarding the impact of spaced learning on memory. Both theories are notable for explaining the gap effect in memory. The first category includes deficit processing theories in psychology, consistently demonstrating that learning is affected by intervals between study sessions. Therefore, considering such theories, this study initially aimed to determine the impact of massed and spaced instructions on Iranian EFL learners' reading comprehension and motivation by conducting the current quantitative study.

Many EFL learners often equate reading comprehension with meticulous translation and understanding of each word, so the ultimate objective lies in grasping the main ideas. Thus, it becomes imperative to acquaint them with the process of reading and comprehending English texts. Limited studies have been conducted to explore the impacts of massed versus spaced instructions on Iranian EFL learners' reading comprehension. Additionally, within the Iranian context, a predominant emphasis exists on accommodating large class sizes for EFL courses, resulting in a dearth of spaced instructional sessions. Consequently, this study endeavored to bridge this gap. Typically, Iranian EFL courses allocate approximately four hours per week to intensive English learning. However, due to the constraints of this limited timeframe, Iranian English teachers are not inclined toward implementing spaced instruction. This insufficiency in time allocation proves insufficient for attaining English proficiency, thus prompting a preference among teachers for massed instruction over spaced instruction. To delve into this matter further, the researchers undertook a comparative analysis to discern the

differential effects on reading comprehension and motivation between those subjected to spaced versus massed instruction.

According to a study by Timmr et al. (2020), a split-learning lecture involves the lecturer repeatedly presenting the material they need to learn immediately. The researchers aimed to investigate whether this altered curriculum would improve student retention. One hundred forty-eight second-year medical students were randomly assigned to the interval study or the conventional lecture group. In the interval study group, the students underwent three 15-minute study sessions with a five-minute break per session. This intermission lecture approach was designed to eliminate gaps in information retention by presenting the same content, including abstracts, in a condensed form. Before the course, all students took a fundamental knowledge test, and their retention of the material was evaluated eight days after the lecture. After accounting for the student's progress, the results indicated no significant difference between the interval study group and the traditional lecture group regarding their retention test scores.

In a different study, the retention of grammatical structures by EFL students was examined by Mashhadi and Farvardin (2017); they divided the participants into spaced and mass distribution and a control group. The spaced group participated in three sessions held at regular intervals, but the massed group had one intensive session. An error correction test was administered three times to collect data. The findings indicated the spaced group's performance on the delayed post-test was better. The researchers concluded that spacing as an instructional strategy can improve the retention and recall of English grammatical structures. As documented in the literature, in Iran, a limited number of studies have dealt with the issue of spaced and massed reading instruction with an emphasis on vocabulary acquisition. As a result, this study aimed to examine the influences of massed and spaced instruction on reading comprehension and reading motivation of EFL students in Iran.

The significance of this research lies in its ability to provide valuable insights to educators and curriculum developers regarding the most productive approaches to teaching and learning. Given the growing emphasis on evidence-based techniques in education, comprehending the consequences of spaced versus massed instruction on

student learning outcomes holds the utmost significance. Moreover, the research significantly centered on Iranian EFL learners, offering significant perspectives on the efficacy of diverse pedagogical approaches within a distinct cultural and linguistic milieu. This study can assist educators in customizing their instructional methods to cater to the requirements of their students effectively. In addition, the study delved into several dimensions of learning, such as reading comprehension and motivation. Examining a wide range of outcomes, the researchers attempted to provide a comprehensive understanding of the influences of massed and spaced instruction on various aspects of learning. Understanding the role of attitudes in reading comprehension through appropriate instructions can help educators develop effective methods and strategies to motivate and engage learners, ultimately leading to more successful language acquisition and communication skills. By addressing learners' attitudes and beliefs about language learning, educators can help create a positive and empowering learning experience for their students. Hence, this research endeavored to answer the following questions.

**RQ1.** Is there any significant difference among the effects of massed, spaced, and traditional reading instructions on reading comprehension of Iranian EFL learners?

**RQ2.** Is there any significant difference among the effects of massed, spaced, and traditional reading instructions on reading motivation of Iranian EFL learners?

### 3. Method

#### 3.1. Design of the Study

To fulfill the present quasi-experimental study's objectives, the researchers adopted a non-equivalent control group pre-test-posttest design. Its objective was to explore cause-and-effect associations between variables in positions where randomization was not feasible. The research investigated the impacts of an intervention in an authentic setting, albeit with less control over confounding variables, compared to a well-designed experimental study. Pretest and post-test were used to collect quantitative data. The study included two experimental groups and a control group, targeting spaced and massed instructions as independent variables while measuring reading comprehension

and reading motivation as dependent variables.

### **3.2. Participants**

To conduct the research, 300 Iranian EFL learners initially took the Oxford Quick Placement Test (OQPT). From this initial pool, a sample of 150 EFL intermediate participants was selected non-randomly from four English Language Institutes in Gilan Province. The age range of the participants was between 16 and 21 years old. Then, using random sampling technique, the participants were assigned into the spaced instruction group, the massed instruction group, and control group. To ensure consistency, the same teacher instructed all experimental and control groups, effectively controlling for any teacher-related effects. The teacher was required to gain proficiency and understanding of the designated instructional methods and apply them consistently across all experimental and control groups.

### **3.2. Instruments**

The study used some instruments to collect the required data. First, the OQPT is a standardized test that determines the participants' level of English proficiency. The OQPT served as the study's initial instrument. It was administered to assist the researcher in selecting homogeneous learners. Based on this exam, students whose scores fell between 30 and 47 (out of 60) were classified as intermediate and served as the study's target group.

Another instrument was a reading comprehension test (used as the pre-test and post-test) to evaluate reading comprehension skills. The test had 40 questions in various formats: multiple-choice, true-false, and fill-in-the-blanks. The questions were prepared based on the content from the American English File 3 (Latham-Koenig et al., 2015). The pretest aimed to objectively evaluate the participants' reading comprehension level, as it was hypothesized that they might comprehend the text but face challenges in expressing it in English. The test was reviewed, and its content was confirmed by three applied linguists with more than ten years of experience in test-making. The reliability of the pretest and post-test was estimated through Cronbach's alpha, resulting in a reliability index of 0.85.

Next, a five-point Likert scale, a 30-item modified version of the Motivation for Reading Questionnaire (MRQ) was also used to assess reading motivation of the participants before and after the treatment. The MRQ, first created by Wigfield and Guthrie in 1997, was intended to measure various aspects of reading motivation, such as social interaction, competition, compliance, reading avoidance, challenge, curiosity, reading engagement, importance, and recognition. Wigfield and Guthrie (1997) also conducted factor analyses and confirmed the construct validity of the MRQ, identifying eleven factors with a total of 53 items. The reliability of the different sections of the questionnaire ranged from .43 to .81. However, for the current research, the researchers selected 30 items to measure eight aspects of reading motivation, including reading efficacy, reading challenge, reading curiosity, reading involvement, the importance of reading, reading work avoidance, social reasons for reading, and reading for grades. The modified MRQ was first content-validated by three applied linguists who were university professors and had more than ten years of teaching experience. Then, it was piloted with a group of learners with characteristics similar to the study participants. The reliability of the modified MRQ was calculated through Cronbach's alpha based on the pilot testing with individuals whose characteristics were similar to the students in the main study. The questions and choices were reordered for the post-test to minimize potential bias from students recalling their initial answers. The structural and content validity of both the pretest and post-test were thoroughly scrutinized and endorsed by two language experts, ensuring the credibility and efficacy of these evaluation tools.

### 3.3. Procedure

First, the researchers used non-random convenience sampling to select 150 homogeneous students. Then, they randomly assigned them into two experimental groups and one control group with an equal number of students in each group ( $n_1=n_2=n_3=50$ ). Second, the researcher administered a teacher-made reading test as for reading comprehension and the modified version of MRQ (Wigfield & Guthrie, 1997) as pre-tests to examine the participants reading and motivation levels before the treatment.

The study took 20 sessions. In the first two sessions, the OQPT and the pretests were administered, respectively. Subsequently, 16 sessions were allocated to practicing



reading in the groups. In each session, one passage was taught. The 19th and 20th sessions were allocated to administer the reading comprehension post-test and MRQ questionnaire assessment.

During the treatment, the participants in the experimental groups received the instructional treatment; however, the kind of exposure to the treatment was different in the groups. In the spaced class, the 90-minute duration was divided into three 30-minute sessions, with any session taking place on separate days. Specifically, the spaced class was conducted three times a week, whereas the massed class was held once a week. The massed instruction group received an intensive 90-minute session during the treatment phase. In contrast, the spaced instruction group received three 30-minute sessions spread over time (approximately 90 minutes total). It is worth mentioning that the length of treatment time for the control group was similar to that of the massed group, 90 minutes one day a week, but with the difference in the treatment method of the two experimental groups mentioned in the above paragraph.

The experimental groups were taught reading using either spaced or massed instruction, such as pre-reading, while-reading, and post-reading strategies. In the teaching process, during the pre-reading phase for the experimental groups, interactive activities such as discussions, brainstorming, and visual aids were used to promote collaboration among participants and generate interest in the reading material. Strategies like identifying topic sentences, skimming for specific details, and scanning for main ideas and key information were employed throughout the while-reading phase for both spaced and massed groups. In the post-reading phase, the focus was on participants' interests, with discussions and questions aimed at eliciting direct responses to the text (thin questions) or encouraging deeper analysis and applying prior knowledge (thick questions). Additional activities included character analysis to encourage critical examination and ensure a thorough understanding of the text.

In contrast, the control group received the traditional method of instruction for reading comprehension. In the control group, the teacher employed techniques such as reading aloud, where the teacher read comprehension texts to the students, incorporating variations in pitch, tone, volume, pauses, eye contact, questions, and comments to

enhance the presentation and make it engaging. Following the reading of the texts, the students in the control group were asked to provide correct answers to questions related to the text and write a summary paragraphs. The summary paragraphs were to be written in their own words and should have contained the main ideas of the original text.

### 3.5. Data Analysis

The current study used SPSS Software, version 25, to analyze the collected data. The analysis included several steps. First, the Kolmogorov-Smirnov (K-S) test was used to check the normal distribution of the data. Then, the researchers utilized One-way ANOVA to examine if there were significant differences in reading comprehension and reading motivation scores among various groups, likely representing different treatment conditions. Following the initial phase of ANOVA, a posthoc was used through Tukey's HSD to make pairwise comparisons among the three groups to determine which group performed better than the other two. Additionally, the Bonferroni correction was utilized to adjust significance levels for multiple comparisons, aiming to mitigate the risk of Type I errors by establishing a more stringent threshold for statistical significance.

## 4. Results

Before comparing the mean variations among the spaced, massed, and control groups, the normality of the Reading Comprehension pre-tests was evaluated. Table 1 presents the outcomes of the Kolmogorov-Smirnov test assessing the normality of the pretest scores for the Reading Comprehension spaced, massed, and control groups.

**Table 1.** The Results of the Kolmogorov-Smirnov Test for Pre-test Reading Comprehension Scores

| Groups |                                | Reading Comprehension PRE |       |
|--------|--------------------------------|---------------------------|-------|
| Spaced | N                              |                           | 50    |
|        | Normal Parameters <sup>a</sup> | Mean                      | 25.72 |
|        |                                | Std. Deviation            | 2.733 |
|        | Most Extreme Differences       | Absolute                  | .144  |
|        |                                | Positive                  | .144  |
|        |                                | Negative                  | -.080 |

|                |                                |                |           |
|----------------|--------------------------------|----------------|-----------|
| <b>Control</b> | Kolmogorov-Smirnov Z           |                | 1.017     |
|                | Asymp. Sig. (2-tailed)         |                | .252      |
|                | N                              |                | 50        |
|                | Normal Parameters <sup>a</sup> | Mean           | 25.00     |
|                |                                | Std. Deviation | 2.711     |
|                | Most Extreme Differences       | Absolute       | .116      |
|                |                                | Positive       | .116      |
|                |                                | Negative       | -.074     |
|                | Kolmogorov-Smirnov Z           |                | .821      |
|                | Asymp. Sig. (2-tailed)         |                | .511      |
| <b>Massed</b>  | <b>N</b>                       |                | <b>50</b> |
|                | Normal Parameters <sup>a</sup> | Mean           | 25.26     |
|                |                                | Std. Deviation | 2.820     |
|                | Most Extreme Differences       | Absolute       | .117      |
|                |                                | Positive       | .117      |
|                |                                | Negative       | -.084     |
|                | Kolmogorov-Smirnov Z           |                | .825      |
|                | Asymp. Sig. (2-tailed)         |                | .503      |

As Table 1 shows that the p-values for Pretest scores ( $p=.252, .511, .503 > .05$ ) exceeded the significance level of .05, indicating a normal distribution of scores. After confirming the assumption of normality, the subsequent step involved assessing whether there exists a significant disparity in reading comprehension between the control, the massed, and spaced groups.

To address the first research question, a one-way Analysis of Variance (ANOVA) was conducted (Table 2). The statistical test compared means across three groups: spaced instruction, massed instruction, and a control group. This test determined whether these groups' observed differences in mean reading comprehension scores were statistically significant or likely due to random variation.

**Table 2.** One-way Analysis of Variance Regarding Reading Comprehension Post-test

|                | Sum of Squares | df  | Mean Square | F        | $\eta^2$ | Sig. |
|----------------|----------------|-----|-------------|----------|----------|------|
| Between Groups | 690.293        | 2   | 345.147     | 39.973   | 0.352    | .000 |
| Within Groups  | 1269.280       | 147 | 8.635       |          |          |      |
| Total          |                | 149 |             | 1959.573 |          |      |

Table 2 indicates a significant difference between the groups [ $F(2, 147) = 39.97, p < .001$ ]. The eta-squared ( $\eta^2$ ) effect size measure was used to assess the effective size

of the table. The ratio of the sum of squares between groups (690.293) to the total sum of squares (1959.573) yielded an eta-squared value of 0.352, indicating that 35.2% of the variance in the data can be attributed to group differences.

It is crucial to note that this ANOVA Table 2 alone does not reveal the specific differences between the groups. The researchers ran Tukey and Bonferroni post-hoc tests to pinpoint which groups differ significantly. Table 3 presents the results of Tukey HSD and Bonferroni, which adjust for multiple comparisons to manage the overall Type I error rate.

**Table 3.** Post Hoc Test for Comparing the Groups

|            | (I) Student Group | (J) Student Group | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval |             |
|------------|-------------------|-------------------|-----------------------|------------|------|-------------------------|-------------|
|            |                   |                   |                       |            |      | Lower Bound             | Upper Bound |
| Tukey HSD  | Control           | Massed            | 3.44000*              | .58769     | .000 | 2.0485                  | 4.8315      |
|            |                   | Spaced            | 5.16000*              | .58769     | .000 | 3.7685                  | 6.5515      |
|            | Massed            | Control           | -3.44000*             | .58769     | .000 | -4.8315                 | -2.0485     |
|            |                   | Spaced            | 1.72000*              | .58769     | .011 | .3285                   | 3.1115      |
|            | Spaced            | Control           | -5.16000*             | .58769     | .000 | -6.5515                 | -3.7685     |
|            |                   | Massed            | -1.72000*             | .58769     | .011 | -3.1115                 | -.3285      |
| Bonferroni | Control           | Massed            | 3.44000*              | .58769     | .000 | 2.0168                  | 4.8632      |
|            |                   | Spaced            | 5.16000*              | .58769     | .000 | 3.7368                  | 6.5832      |
|            | Massed            | Control           | -3.44000*             | .58769     | .000 | -4.8632                 | -2.0168     |
|            |                   | Spaced            | 1.72000*              | .58769     | .012 | .2968                   | 3.1432      |
|            | Spaced            | Control           | -5.16000*             | .58769     | .000 | -6.5832                 | -3.7368     |
|            |                   | Massed            | -1.72000*             | .58769     | .012 | -3.1432                 | -.2968      |

The results of the post-hoc tests in Table 3 indicate significant differences between the control and massed instruction groups ( $p < .000$ ), with the massed group scoring significantly lower on reading comprehension. Additionally, significant differences ( $p < .001$ ) were found between the spaced and massed groups, with the spaced group scoring significantly higher. Furthermore, a significant difference ( $p < .001$ ) was observed between the spaced and control groups, with the spaced group performing better. Lastly, the difference between the massed and spaced groups was found to be significant at the 0.011 (Tukey) and 0.012 (Bonferroni) levels, confirming the superior performance of the spaced instruction group. The results suggest that both spaced and massed instructions

had a positive impact on Iranian intermediate EFL learners' reading comprehension, was supported.

In the next phase, before examining the mean differences between the spaced and control groups, the researcher should assess the normality of the Reading Motivation pre-tests. Table 4 presents the results of the Kolmogorov-Smirnov test of normality for the Reading Motivation pre-tests.

**Table 4.** The Results of Kolmogorov-Smirnov Test for Pre-test Reading Motivation Scores

| Groups                 |                                | Reading Motivation<br>PRE |       |
|------------------------|--------------------------------|---------------------------|-------|
| Spaced                 | N                              | 50                        |       |
|                        | Normal Parameters <sup>a</sup> | Mean                      | 47.48 |
|                        |                                | Std. Deviation            | 6.717 |
|                        | Most Extreme Differences       | Absolute                  | .061  |
|                        |                                | Positive                  | .053  |
|                        |                                | Negative                  | -.061 |
|                        | Kolmogorov-Smirnov Z           |                           | .434  |
|                        | Asymp. Sig. (2-tailed)         |                           | .992  |
| Control                | N                              | 50                        |       |
|                        | Normal Parameters <sup>a</sup> | Mean                      | 47.18 |
|                        |                                | Std. Deviation            | 6.877 |
|                        | Most Extreme Differences       | Absolute                  | .063  |
|                        |                                | Positive                  | .062  |
|                        |                                | Negative                  | -.063 |
|                        | Kolmogorov-Smirnov Z           |                           | .448  |
|                        | Asymp. Sig. (2-tailed)         |                           | .988  |
| Massed                 | N                              | 50                        |       |
|                        | Normal Parameters <sup>a</sup> | Mean                      | 47.20 |
|                        |                                | Std. Deviation            | 6.676 |
|                        | Most Extreme Differences       | Absolute                  | .077  |
|                        |                                | Positive                  | .077  |
|                        |                                | Negative                  | -.069 |
|                        | Kolmogorov-Smirnov Z           |                           | .548  |
| Asymp. Sig. (2-tailed) |                                | .925                      |       |

As the results in Table 4 indicate, the significance level in Reading Motivation pretest scores is higher than the p-value of .05 ( $p=.992, .988, .925 > .05$ ), the results of the Kolmogorov-Smirnov test for pre-test reading motivation scores show that the distribution

of scores in all three groups (Spaced, Control, and Massed) is not significantly different from a normal distribution. This suggests that the pre-test reading motivation scores in each group follow a normal distribution, which is an important assumption for many statistical analyses.

The influence of instructional spacing on reading motivation among Iranian intermediate English as a Foreign Language (EFL) learners was investigated using a one-way ANOVA. The mean scores of three groups were compared: learners exposed to spaced instruction, learners exposed to massed instruction, and a control group. Table 5 summarizes the findings of this ANOVA.

**Table 5.** One-way Analysis of Variance Regarding Reading Motivation Post-test

| Post-test Result |                |     |             |        |          |      |
|------------------|----------------|-----|-------------|--------|----------|------|
|                  | Sum of Squares | df  | Mean Square | F      | $\eta^2$ | Sig. |
| Between Groups   | 9233.373       | 2   | 4616.687    | 41.746 | 0.362    | .000 |
| Within Groups    | 16256.900      | 147 | 110.591     |        |          |      |
| Total            | 25490.273      | 149 |             |        |          |      |

Table 5 displays, a significant difference between the groups [  $F(2, 147) = 41.746$ ,  $p < .001$ ]. The eta-squared ( $\eta^2$ ) effect size measure was employed to evaluate the magnitude of the table's impact. By dividing the sum of squares between groups (9233.373) by the total sum of squares (25490.273), an eta-squared value of 0.362 was obtained, suggesting that 36.2% of the variability in the data is attributable to group distinctions.

The ANOVA table indicates a significant difference in reading motivation scores among the groups but does not identify specific group differences. Additional analysis using post-hoc tests is necessary to clarify these specific group differences. Table 6, post-hoc tests (Tukey HSD and Bonferroni) show significant differences in reading motivation between the control, massed instruction, and spaced instruction groups, addressing the second research question.

**Table 6.** Post Hoc Test for Comparing the Groups

|            | (I) Student Group | (J) Student Group | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval |             |
|------------|-------------------|-------------------|-----------------------|------------|------|-------------------------|-------------|
|            |                   |                   |                       |            |      | Lower Bound             | Upper Bound |
| Tukey HSD  | Control           | Massed            | 12.38000*             | 2.10325    | .000 | 7.4002                  | 17.3598     |
|            |                   | Spaced            | 18.92000*             | 2.10325    | .000 | 13.9402                 | 23.8998     |
|            | Massed            | Control           | -12.38000*            | 2.10325    | .000 | -17.3598                | -7.4002     |
|            |                   | Spaced            | 6.54000*              | 2.10325    | .006 | 1.5602                  | 11.5198     |
|            | Spaced            | Control           | -18.92000*            | 2.10325    | .000 | -23.8998                | -13.9402    |
|            |                   | Massed            | -6.54000*             | 2.10325    | .006 | -11.5198                | -1.5602     |
| Bonferroni | Control           | Massed            | 12.38000*             | 2.10325    | .000 | 7.2866                  | 17.4734     |
|            |                   | Spaced            | 18.92000*             | 2.10325    | .000 | 13.8266                 | 24.0134     |
|            | Massed            | Control           | -12.38000*            | 2.10325    | .000 | -17.4734                | -7.2866     |
|            |                   | Spaced            | 6.54000*              | 2.10325    | .007 | 1.4466                  | 11.6334     |
|            | Spaced            | Control           | -18.92000*            | 2.10325    | .000 | -24.0134                | -13.8266    |
|            |                   | Massed            | -6.54000*             | 2.10325    | .007 | -11.6334                | -1.4466     |

The post-hoc tests in Table 6 revealed significant differences in reading motivation between the groups. Students in the spaced instruction group showed significantly higher reading motivation than those in the control group. Similarly, the massed instruction group exhibited significantly higher reading motivation than the control group. Interestingly, the spaced instruction group also demonstrated significantly higher reading motivation than the massed instruction group. These findings suggest that both spaced and massed instructions were effective in boosting reading motivation compared to no intervention. However, spaced instruction seemed more effective in promoting reading motivation than massed instruction. The research found that both massed and spaced instruction significantly improved reading motivation among Iranian intermediate EFL learners, as compared to traditional instruction. However, spaced instruction emerged as the more effective method, demonstrating a more significant impact on reading motivation than massed instruction.

## 5. Discussion

The present investigation sought to assess the effects of spaced and massed instruction on reading comprehension and reading motivation among Iranian EFL learners. The findings unequivocally demonstrated that students who received spaced instruction achieved significantly higher results than those in the control group, supporting the notion that distributing learning sessions over time is a superior approach to learning compared

to continuous or concentrated instruction. These results are consistent with prior research emphasizing the benefits of spaced learning for improving retention and overall learning outcomes (). The results also highlighted that the average scores for reading comprehension and reading motivation were higher than massed instruction cohort when utilizing spaced instruction, indicating statistically significant differences between the two groups. The outcomes underscored the significance of spaced instruction for intermediate EFL learners in Iran, demonstrating its superiority over mass instruction in producing positive results, including improved reading and concept comprehension, as well as heightened motivation for reading.

The findings of this research indicated that spaced instruction, characterized by the distribution of study sessions over time with intervals for reinforcement and review, had a positive impact on reading comprehension and motivation. Spaced learning facilitates repeated exposure to content over an extended period, facilitating information absorption, pattern recognition, and the formation of connections between ideas and concepts. Additionally, the incorporation of various learning activities within spaced instruction helps maintain learners' motivation, preventing cognitive overload and burnout. Besides, this approach establishes a supportive learning environment that sustains reading motivation and enhances performance. Motivation is particularly vital for EFL learners as it not only enhances reading comprehension but also plays a crucial role in fostering critical thinking skills. EFL educators should provide opportunities for students to excel, nurturing their motivation and improving both their reading comprehension and critical thinking capabilities.

Valuable insights into effective learning strategies are provided by studies conducted in experimental psychology. These studies shed light on the benefits of spaced education in maximizing long-term memory retention and emphasize the importance of incorporating interval-based learning approaches in various educational settings. Gashti et al. (2024) reaffirm the results of this study, supporting the idea that spaced learning is more effective than mass learning. The findings demonstrate that the spaced group outperformed the massed group in reading comprehension during the post-test. To build on these findings, students should receive distributed instructions at regular intervals to increase the likelihood of retaining acquired knowledge until it can be reinforced. Several



methods can be utilized to enhance learning, such as incorporating random prompts, providing explicit instructions, or including specific activities for speaking, reading, or writing tasks. Miles (2014) further strengthens the credibility of the study's results, reinforcing the benefits of spaced learning and highlighting the value of incorporating interval-based instructional strategies that promote effective knowledge retention.

The results of the current study align with previous research conducted by Carpenter et al. (2012), supporting the concept of coding variability strategy. This strategy suggests that when two items are distinct, they are more likely to undergo distinctive encoding in the participant's mind (Goossens et al., 2014). The idea of variations in memory representation is further supported in different settings where separate elements are presented, providing additional cues that aid retrieval. Therefore, the usefulness of spaced distribution instruction often leads to more effective recall. Carpenter et al. (2012) emphasize the significance of variability in the in-memory representation and its impact on memory performance. The concept that spaced distribution instruction enhances recall aligns with the principles of coding variability theory. By incorporating spaced intervals and exposing learners to different contexts during the learning process, memory retrieval is strengthened, resulting in improved overall recall.

Further, the results of the study demonstrate that the spaced MRQ group exhibited a significantly higher post-test reading motivation score compared to the massed MRQ group. This highlights the potential advantages of utilizing spaced repetition methods in enhancing knowledge retention and increasing motivation. The findings suggest that the incorporation of spaced education techniques contributed to this enhancement. These outcomes are in line with Gashti et al. (2024) & Guthrie et al. (2000) perspectives who emphasized the crucial role of motivation in reading. Motivation serves as a key driver that motivates individuals towards specific objectives, with students who find pleasure in reading typically allocating more time to the activity, while those with lower interest levels tend to avoid it (Gashti et al., 2024).

The findings of this study are consistent with those of Bird (2010), who investigated the effects of direct L2 grammar teaching using delayed teaching methods. The study showed that the group with spaced learning outperformed the group with concentrated

learning. Furthermore, it was observed that the group with massed learning did not reveal any improvement. Also, the findings of this study agree with those of Mashhadi and Farvardin (2017), who investigated the impacts of individual and mass learning on the retrieval and retention of grammatical structure in ESL learners. The results of their research displayed that the Gap group had better times than the other two groups on the delayed final test. However, there were no statistically significant differences between the peripheral and combined groups at the last direct test.

The results of this first study using the Reading Motivation Questionnaire provide significant new information about students' reading motivation nature and how student reading motivation is related to student reading demeanor. The study revealed that the participants in the spaced instruction group exhibited strong motivation towards reading. Notably, the concept of spaced repetition, involving repeated exposure to information at increasing intervals, has been extensively researched in cognitive psychology. The well-documented spacing effect suggests that the utilization of spaced repetition has been shown to result in enhanced memorization and learning outcomes compared to massed repetition, where information is repeated at short intervals. This likely played a role in the observed positive changes in participants' reading behavior and comprehension skills. The study also indicates that the formation of positive reading habits and the use of spaced repetition techniques in reading comprehension instruction contributed to participants' favorable reading behavior.

## 6. Conclusion

Overall, the research highlights the importance of incorporating spaced repetition techniques in reading instruction to enhance learning outcomes and foster positive reading habits among students. By leveraging these findings, educators can design more effective curricula, develop materials that support spaced repetition, and implement teaching strategies that promote long-term retention and comprehension skills.

The findings of the current study may encourage educators to engage in time-shifted instruction as a means of enhancing student learning, given its perceived superiority over mass and traditional instructions. The outcomes have the potential to

guide English teachers in the implementation of spatial instruction. The knowledge gleaned from this research is expected to support L2 educators, researchers, and curriculum developers in understanding how English reading instruction can be effectively carried out through spaced teaching methods.

The outcome of this investigation demonstrated that the utilization of spatial training contributed to a more robust reading comprehension compared to the utilization of massive training. Given the results gleaned from the study, it can be inferred that the process of learning through face-to-face events at different intervals permits the acquired information to be adequately retained until the next chance for acquisition of knowledge presents itself, either by chance through exposure or intentionally through instruction, or due to a desire to apply a specific element in speech, reading, and so forth.

In the academic context of learning foreign language skills, specifically in the domain of reading comprehension, the inclusion of delayed learning brings forth numerous advantages. The implementation of distributed training enhances students' confidence in their ability to comprehend what they read. The findings of this research suggest that individuals studying English should actively utilize spatial training to track their development and improve their learning. The results of this study could assist educators in conducting their classrooms through spaced techniques, as this instructional approach proves to be more effective than conducting classes in bulk. The results will also assist English teachers in deciding whether to employ spatial education or bulk instruction.

It is crucial to examine the impacts of massed and spaced instructions on elementary, upper intermediate, and advanced learners. This will provide a comprehensive insight into the effectiveness of these methods and help educators make informed decisions in creating a victorious learning environment. This exploration would help to reasonably comprehend how teaching methods impact students of different ability levels. Additionally, while this study primarily focused on Iranian EFL students, conducting similar investigations in other EFL and ESL settings would enhance the breadth of the findings. This would enable the examination of potential variations and cultural influences on the phenomena under study. Future research could replicate the analysis by extending the treatment period and conducting multiple post-tests with time intervals in between. It

should be emphasized that care must be taken when generalizing the findings of this study to all language learners, as the research was centered around intermediate Iranian EFL students. Finally, the participants selected for the study were limited to individuals aged between 16 and 21 years old, so the conclusions may not apply to other age groups. These suggestions will furnish helpful guidelines for future research, enabling a deeper investigation and comprehension of how teaching methods affect language acquisition.

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