The Comparative Effect of Spacing Instruction and Massed Instruction on Intermediate EFL Learners’ Reading Comprehension

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Abstract
This study compared the effects of spacing and massed instructions on Iranian English as a foreign language (EFL) learners’ reading comprehension. To fulfill this objective, 50 Iranian participants were selected among 80 students based on the results of Oxford Quick Placement Test (OQPT). The intermediate selected participants were then randomly divided into two equal experimental groups; spacing group and massed group. Afterward, the researcher measured the participants’ English reading comprehension by administering a reading comprehension pretest. Then, five English texts from Active One Book were instructed to both experimental groups. In the massed class, each text was taught in an intensive 60-min session, whereas each text was taught to the spaced group in three short sessions (about 60 min in total). The first session lasted for 20 min; the second occurring 2 days after the initial session lasted 20 min; and the third session took 20 min and was held 2 days after the second session. After the instruction, a reading posttest was administered to the both groups and finally the data were analyzed by using paired and independent samples t tests. The obtained results indicated that there was a significant difference between the posttests of spacing and massed groups. The findings indicated that the spacing group significantly outperformed the massed group (p < .05) on the posttest. The implications of this study can make the teachers aware that teaching through spaced intervals can provide better results than teaching through one massed session.

Keywords
massed instruction, spacing instruction, reading comprehension

Introduction
Research in the field of experimental psychology has uncovered that teaching given in efficiently spaced interspersed (spaced circulation) results in preferred long-term maintenance over teaching given in one protracted, continuous session (massed dissemination). For example, students burning through 30 min taking in a rundown of words would have longer maintenance of the words if they partitioned that 30 min into three 10-min sessions spread out more than a few days or weeks, instead of investing the energy in one massed 30-min session. This marvel, known as the spacing impact, has been demonstrated in various learning regions and is viewed as one of the more legitimate outcomes in memory studies (Baddeley, 1997; Miles, 2014). For recollecting data, the spacing effect has been checked in many learning spaces, including science (e.g., Rohrer & Taylor, 2006), L1 vocabulary procurement among youngsters (Childers & Tomasello, 2002), recalling material science certainties, and in remembering pictures (e.g., Toppino, 1993). The separating impact has likewise been demonstrated viable in content preparing errands (e.g., Seabrook, Brown, & Solity, 2005).

Rohrer and Taylor (2006) affirmed the vital advantage of utilizing the spacing impact for complicated numerical ability movement. Moulton et al. (2006) affirmed that teaching a specific medical procedure strategy through spaced intervals (Miles, 2014, p. 413). For recollecting data, the spacing effect has been checked in many learning spaces, including science (e.g., Rohrer & Taylor, 2006), L1 vocabulary procurement among youngsters (Childers & Tomasello, 2002), recalling material science certainties, and in remembering pictures (e.g., Toppino, 1993). The separating impact has likewise been demonstrated viable in content preparing errands (e.g., Seabrook, Brown, & Solity, 2005).

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gave premiere results than instructing through one massed circulation practice session, as demonstrated in a 1-month delayed posttest (Miles, 2014). Shebilske, Goettl, Corrington, and Day (1999) expressed that students learned an unpredictable PC recreation-preparing errand better through divided appropriation of training sessions in contrast with massed circulation sessions. These outcomes prescribe that the separating impact procedure goes past straightforward repetition retention of realities, and may help in more mind-boggling exercises, which require the incorporation of various scholarly skills.

In the field of second language learning, researchers in vocabulary procurement have composed much about the hearty discoveries of the spacing impact and its conceivable applications for second language students (e.g., Miles, 2014; Nation, 2001; Takac, 2008). Schmitt (2000) contended for the role of outstretching practice in vocabulary learning, insisting Pimsleur’s (1967) articulation that as overlooking tends to happen not long after a thing is found out, most redundancies ought to occur inside 7 days of adapting new substance, with later reiterations coming at progressively separated interims (Miles, 2014).

Impacts of spacing teaching have not been analyzed on reading comprehension. Researchers have characterized reading cognizance as “... a basic piece of the diverse interchange of systems associated with L2 reading” (Brantmeier, 2003, p. 52). Reading comprehension among language learners may be different from each other. Related to this, Brantmeier (2003) attested that processing the writings similarly or in an unexpected way, students may have non-indistinguishable translation of the writings. It implies that, language students may process the content correspondingly; however, appreciate in an unexpected way, or process the writings contrastingly, but understand similarly.

Day and Park (2005) specified a few sorts of reading comprehension, which are helpful for the language students to get intuitive readers. The first is “literal comprehension.” It “... alludes to a comprehension of the clear significance of the content, for example, actualities, vocabulary, dates, times, and areas” (Day & Park, 2005, p. 62). Coordinate reactions are required for reading inquiries of this cognizance. As per Day and Park (2005), literal comprehension might be gainful for instructors to know whether students understand the significance of the content or not. The second kind of the reading comprehension alludes to “reorganization” in which learners must use data from various parts of the content and orchestrate them for supernumerary cognizance (Day & Park, 2005). Reading comprehension inquiries of this compose can make language students to read the content by and large. “Inference” is the third sort of the reading comprehension. Making inferences includes more than a literal comprehension. Students may at first have a troublesome time noting deduction questions because the appropriate responses depend on material that is in the content, yet not expressly expressed. An inference includes students consolidating their literal comprehension of the content with their own insight and instincts (Day & Park, 2005).

Day and Park (2005) claimed that an inference involves learners synthesizing their literal comprehension of the text with their own knowledge and guesses (Day & Park, 2005). Another type of the comprehension, according to Day & Park (2005), is “prediction.” Students are assumed to guess-timate the conclusive events and occurrences of the text. Evaluation is the fifth type of reading comprehension. It necessitates the students to give a universal or comprehensive adjudication about some aspect of the passage. To answer this type of question, pupils should use both a literal comprehension of the text and their knowledge of the text’s topic and related issues (Day & Park, 2005).

Review of the Literature

Theoretical Background

In his original work Über das Gedächtnis, Ebbinghaus followed his own particular capacity to remember and review an arrangement of hogwash syllables, which had no preestablished relationship in his memory. In doing so, he made the world’s first learning and overlooking bends. More importantly, however, he was the first to describe what would later be known as the spacing effect. Ebbinghaus found that reviews of material to be retained are most beneficial if they come at spaced intervals (Ebbinghaus, 1885). Simply put, memory performance is more awful when material is reviewed quickly (massed repetitions); significantly more learning happens. The spacing effect is apparently “the most replicable and robust finding from experimental psychology” (Dempster, 1989, p. 314). Hundreds of articles, including a number of reviews (e.g., Dempster, 1988) and meta-analyses (e.g., Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006), have found a spacing effect in a wide variety of memory tasks.

Two fundamental hypothetical records of spaced distribution practice are known as encoding variability and deficient processing (Greene, 1989). Encoding variability theory accentuated on the fact that “spaced materials are preferably remembered over the massed ones, because each presentation in the spaced distribution is encoded variously, hence providing more retrieval cues” (Lohnas & Kahana, 2014, p. 759). As a matter of fact, “this theory emphasizes the role of the context and claims that the context in which an item is presented is encoded together with its meaning” (Anderson & Bower, 1972, p. 108). On the contrary, deficient processing theory (Challis, 1993) suggests that the second presentation of massed materials does not get adequate processing, as the former presentation is still excessively recent. In contrast, when a subject is presented after some time has passed and after some intervening items have been shown, full processing will be indispensable, because the former presentation will not be as easily accessible as in the case of massed sequences.
In the interim, the overwhelming majority of past researches have divulged the more prominent learning capability of spaced instruction over massed instruction in learning of grammar (Miles, 2014), vocabulary (Miles & Kwon, 2008; Nakata, 2015), and reading (Seabrook et al., 2005). There is late proof that spaced distribution training is première to distribution instruction in the maintenance of target language structures, that is, when learning is evaluated following a delayed posttest (Miles, 2014).

Miles (2014) believed that the spacing effect may also be beneficial for expanding intricate skills beyond rote memorization. Baddeley and Longman (1978) stated that the spacing instruction is useful for the students learning to touch-type. A group practicing typing for 1 hr per day reached the study’s proficiency objectives in a total of 35 hr. Two other groups practicing for 2 hr a day took about 43 hr to reach the same proficiency target, and a fourth group practicing for 4 hr a day (two 2-hr sessions per day) reached target proficiency after 50 hr of practice (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013).

Most researchers would agree that “reading is a standout amongst the most pivotal aptitudes for instructive and proficient achievement” (Alderson, 2000, p. 34). As to significance of reading comprehension, Rivers (1981) affirmed that reading is the primary expertise in any language class, as it is the wellspring of data and a pleasurable movement. Khatib and Fathi (2012) believed that reading strengthens the student’s other language abilities. Krashen (1981) affirmed that the individuals who read more have bigger vocabulary and, therefore, perform better on composing and language structure tests. As per Krashen (1981), in cutting-edge levels of second language, the capacity to read the composed language at a sensible rate and with complete seeing long been known as oral abilities if not more critical (Khatib & Fathi, 2012).

Empirical Background

With respect to impacts of spacing guidance on English language learning, some observational examinations have been directed, for instance, Miles (2014) led a semitrial pretest, posttest, delayed posttest contemplate on the effect of spaced appropriation instruction on the improvement of chosen grammar things versus massed conveyance instruction. Regardless of the way that the posttests exhibited factually parallel gains on all test composes for both exploratory groups, the delayed posttest outcomes showed that the spaced circulation assembly performed very superior to the massed dissemination bunch on one test compose (blunder investigation and adjustment). Neither one of the groups beat the other on the delayed posttest outcomes of a second test compose (interpretation). Notwithstanding, there were far over the top rates of reduction on benefits from the posttests to postponed posttests for the massed circulation assemble on the two tests, uncovering that achieves made through spaced dissemination instruction were more unfaltering.

Nakata (2015) inspected whether the measure of dividing and maintenance interim may inspire the effects of creating and impartial dispersing on second dialect (L2) vocabulary learning. Twenty English-Japanese word sets were examined by 128 Japanese undergrads. The sort of dispersing (growing and equivalent) and additionally the measure of separating (massed, short, medium, and long) were connected. Results demonstrate a limited, yet measurably noteworthy, preferred standpoint of growing dividing. The outcome is noteworthy on the grounds that this is the primary L2 research to find the matchless quality of growing over equivalent dividing. The real effect of the measure of dispersing was moreover huge, delivering huge impact sizes. For the most part, the discoveries recommended that growing separating may help vocabulary learning in spite of the fact that presenting dispersing may have a monstrous effect.

Lotfolahi and Salehi (2017) used another technique to research different calendars of spacing in youthful English as a foreign language (EFL) students. To this end, they taught youthful EFL students English–Farsi word sets applying different dispersing plans (massed vs. spaced). In the massed condition, students contemplated five-word matches in Session one and five other-word sets multiple weeks later. In the spaced condition, the students contemplated 10-word matches in Session 1 and restudied them multiple weeks later. To expand the advantages of spacing, the analysts fused tests (with restorative input) into various timetables of dividing. At the end of the day, EFL students were prepared to inspect each other on their insight into the vocabulary and to give each other input. Multitweek and after 5 weeks students’ reviews were estimated. The discoveries demonstrated that dispersed practice delivered superlative long-term retention than massed rehearse.

In another study, Mashhadi and Farvardin (2017) investigated the impacts of using spaced and massed distribution instructions on EFL learners’ recall and retention of grammatical structures. To do this study, the researchers chose 72 Iranian EFL junior high school students in a public school. The participants were randomly assigned to spaced distribution \( (n = 24) \), massed distribution \( (n = 23) \), and control \( (n = 23) \) groups. The massed group had one intensive session on learning the target grammatical structures (i.e., the simple present affirmative, negative, and interrogative forms); the spaced distribution group had three sessions at irregular time intervals; while the control group received no instruction. To collect the needed data on the recall and retention of the target structures, an error correction test was administered to the subjects 3 times as the pretest, immediate posttest, and delayed posttest. The consequences of the repeated measures mixed ANOVAs, one-way ANOVAs, and post hoc Tukey tests revealed that the spaced distribution group noticeably outperformed the other two groups on the delayed posttest. However, there was not a significant difference between the spaced and massed distribution groups on the immediate posttest.
There is nutritiously little research on the impacts of spaced instruction in foreign language learning, especially reading comprehension. In fact, empirical studies, which have specifically delved into the effect of spaced and massed distribution instructions on reading comprehension, are few in number, but they are promising. Therefore, this study tried to compare the impacts of spaced and massed instructions on reading comprehension of Iranian EFL learners.

**Research Question and Null Hypothesis**

This study tried to answer the following research question:

**Research Question 1:** Is there any significant difference between Iranian EFL learners’ reading comprehension through spacing instruction and massed instruction?

Based on the abovementioned question, the following null hypothesis was formulated in this study:

**Null Hypothesis:** There is not any significant difference between Iranian EFL learners’ reading comprehension through spacing instruction and massed instruction.

**Method**

**Participants**

To do this research, 50 participants were selected among 80 Iranian students based on the results of Oxford Quick Placement Test (OQPT). The English proficiency level of the participants was intermediate. All the participants were male and native speakers of Persian. The target participants were randomly divided into two equal experimental groups; spacing instruction and massed instruction.

**Instruments**

The first instrument, which was used in the current study was the OQPT. This test was used to homogenize the participants. It assisted the researcher to have a greater understanding of what level (i.e., elementary, preintermediate, intermediate) his or her participants were at. Based on the results of this test, 50 students whose scores were between 40 and 47 were considered as the intermediate level, and they were chosen as the target participants of the current research.

The second instrument, which was used in this study, was a reading comprehension pretest. To realize the participants’ reading comprehension level, a researcher-made pretest was designed based on the students’ course book (Active One). It consisted of 20 objective items including short answer and true or false items. The validity of the pretest was confirmed by a panel of English experts and its reliability was computed through using KR-21 formula (r = .834). The researcher piloted the pretest on another similar group so as to check the feasibility of the test that was going to be held to the target participants.

The third instrument of the current study was a reading comprehension posttest. The posttest was the modified version of the pretest but there was a slight difference between pre- and posttests, that is, the order of options and questions was changed to avoid the students’ recalling of pretest answers.

**Data Collection Procedure**

After making the participants homogeneous, their proficiency level of reading comprehension was measured by a reading comprehension pretest. Afterward, the students in the experimental groups received the same treatment but in different way. The selected reading texts were taught to the experimental groups through spacing instruction and massed instruction. In massed class, each text was taught during 60 min to the students. In fact, 60 min was allocated to each session. In spacing class, the 60 min were divided into three 20-min sessions. The spacing class was held 3 times a week but the massed class was held once a week.

In the treatment phase, the massed group was taught each text in an intensive 60-min session, whereas the spacing group was taught in three short sessions (about 60 min in total). The first session lasted for 20 min; the second occurring 2 days after the initial session lasted 20 min; and the third session took 20 min and was held 2 days after the second session.

The whole instruction lasted eight sessions. In the first two sessions, the OQPT and the pretest were administered, respectively; in five sessions, the students received the treatment (each session one reading text was taught), in the eighth session, the posttest was given to the participants of both experimental groups to measure the effects of the treatment on their reading comprehension.

**Data Analysis**

The gathered data were analyzed through using SPSS software, Version 22. First, Kolmogorov–Smirnov (K-S) test was used to check the quality of data normality. Second, descriptive statistics were calculated. Third, paired and independent samples t tests were run to measure the effects of the treatment on the students’ reading comprehension.

**Results**

The details of the results are illustrated in the following tables.

Before conducting any analyses on the pretest and posttest, it was necessary to check the normality of the distributions. Thus, K-S test of normality was run on the data obtained from the abovementioned tests. The results are shown in Table 1. The p values under the significant column...
in Table 1 determine whether the distributions were normal or not. A $p$ value greater than .05 shows a normal distribution, whereas lower than .05 indicates that the distribution has not been normal. As all the $p$ values in Table 1 were larger than .05, it could be concluded that the distributions of scores for the pretest and posttest obtained from both groups had been normal. It is thus safe to proceed with parametric test (i.e., independent and paired samples $t$ tests in this case) and make further comparisons between the participating groups.

In Table 2, the descriptive statistics of both groups is presented. The massed instruction group’s mean score is 14.12 and the spacing instruction group’s mean score is 14.08. The means of both groups are almost equal. This means that both groups are somehow similar as they are homogeneous at the beginning of the treatment.

Table 1. One-Sample Kolmogorov–Smirnov Test (Groups’ Pre- and Posttests).

|                  | Pretest |          | Posttest |          |
|------------------|---------|----------|----------|----------|
|                  | massed  | spacing  | massed   | spacing  |
| n                | 25      | 25       | 25       | 25       |
| Normal parameters|         |          |          |          |
| $M$              | 14.2400 | 14.0800  | 14.1200  | 16.7200  |
| SD               | 2.58650 | 2.81247  | 2.71293  | 2.03142  |
| Most extreme differences |   |          |          |          |
| Absolute         | .204    | .250     | .220     | .159     |
| Positive         | .204    | .250     | .220     | .158     |
| Negative         | -.137   | -.198    | -.164    | -.159    |
| Kolmogorov–Smirnov $Z$ |   |          |          |          |
|                  | .248    | .089     | .177     | .556     |
| Asymptotically significant (two-tailed) | |          |          |          |

$^a$Test distribution is normal.

Table 2. Descriptive Statistics (Pretest of Both Groups).

| Groups  | n | M      | SD     | SE Mean |
|---------|---|--------|--------|---------|
| Pretest |   |        |        |         |
| Massed  | 25| 14.1200| 2.58650| .51730  |
| Spacing | 25| 14.0800| 2.81247| .56249  |

Table 3. Independent Samples $t$ Test (Pretest of Both Groups).

|                  | Levene’s test for equality of variances | $t$ test for equality of means |
|------------------|----------------------------------------|--------------------------------|
|                  | $F$ | Significant | $t$  | $df$ | Significant (two-tailed) | $M$ difference | SE difference | 95% CI of the difference |
| Equal variances assumed | .470 | .496 | .209 | 48  | .835 | .1600 | .76420 | −1.376, 1.696 |
| Equal variances not assumed | .209 | .476 | .666 | 47  | .835 | .1600 | .76420 | −1.376, 1.696 |

Discussion and Summary

In this part, the research question “Is there any significant difference between Iranian EFL learners’ reading comprehension through spacing instruction and massed instruction?” is answered based on the results obtained in the tables above. After collecting the data, the researcher used paired and independent samples $t$ tests to analyze them to find out the effectiveness of treatment on the students’ reading comprehension. The results revealed that the students who received spacing instruction had better performance compared with those who were trained through massed
instruction. The results statistically revealed that spacing group significantly did better than the massed group ($p < .05$). Therefore, the null hypothesis of the study “There is not any significant difference between Iranian EFL learners’ reading comprehension through spacing instruction and massed instruction” was rejected.

The findings imply that spacing instruction enhanced Iranian EFL learners’ reading comprehension. The findings are in line with previous studies in cognitive psychology (Seabrook et al., 2005), which confirmed the effect of spaced distribution instruction in different domains of learning. Moreover, the results are also corroborating some previous studies (e.g., Miles, 2014; Miles & Kwon, 2008; Rohrer & Pashler, 2007) showing that the spaced distribution instruction improved foreign language learning.

According to Carpenter et al. (2012), “studying information across two or more sessions that are separated (i.e., spaced apart or distributed) in time often produces better learning than spending the same amount of time studying the material in a single session” (p. 5).

According to the encoding variability theory, the more spaced two items are, the more likely it is that they will be encoded differently in the participant’s mind (Anderson & Bower, 1972). This variability in memory representation, which is facilitated by the different contexts in which spaced items appear, provides more retrieval cues. Consequently, remembering is favored in spaced distribution instruction. Besides, according to deficient processing theory, in spaced sequences, the first presentation is not easily accessible at the time of the second presentation, and full processing of the second presentation is thus necessary (Jacoby, 1978). As a result, this processing, in turn, facilitates learning and retention. In effect, it is deemed that when participants are exposed to two items simultaneously or within a short period of time, they do not devote as much attention to these items as when they are presented with sufficient spacing.

The implementation of spaced instruction gives many benefits to the academic field of the foreign language learning, especially to the vocabulary learning. Through using spaced instruction, students can learn more vocabulary items with more self-confidence. The findings of the present study suggest that the English learners should consciously use spaced instruction to manage their performance and to maintain their learning.

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The findings of the present study would encourage teachers to teach their students through spaced instruction as this type of instruction is more useful than the massed one. The findings can help English teachers whether to use spacing instruction or massed instruction. With the knowledge gained from this study, it will be possible for L2 educators, researchers, and curriculum planners to gain insight into how facilitate teaching English language vocabulary through using spacing instruction and massed instruction.

While conducting the present study, some recommendations came across the researcher’s mind. The first recommendation for the next studies is to include more participants

### Table 4. Descriptive Statistics (Posttest of Both Groups).

| Groups   | n  | M   | SD   | SE mean |
|----------|----|-----|------|---------|
| Posttest |     |     |      |         |
| Massed   | 25 | 14.2400 | 2.71293 | .54259 |
| Spacing  | 25 | 16.7200 | 2.03142 | .40628 |

### Table 5. Independent Samples t Test (the Posttest of Both Groups).

|                 | Levene’s test for equality of variances | t test for equality of means | 95% CI of the difference |
|-----------------|----------------------------------------|-----------------------------|--------------------------|
|                 | F   | Significant | t   | df | M difference | SE difference | Lower | Upper |
| Equal variances assumed | 3.569 | .065 | -3.836 | 48 | -.2600 | .67784 | -3.962 | -1.237 |
| Equal variances not assumed | -3.836 | 44.476 | .000 | -2.600 | .67784 | -3.965 | -1.234 |

### Table 6. Paired Samples t Test (Pre- and Posttests of Both Groups).

| Paired differences | M     | SD   | SE | M | SE M | Lower | Upper | t   | df   | Significant (two-tailed) |
|--------------------|-------|------|----|---|------|-------|-------|-----|-----|-------------------------|
| Pair 1 Premassed Postmassed | .12,000 | 1.69115 | .33823 | .33823 | -.5780 | .8180 | .355 | 24 | .726 |
| Pair 2 Prespacing Postspacing | -2.64000 | 1.31909 | .26382 | .26382 | -3.184 | -2.095 | -10.007 | 24 | .000 |
to get more comprehensible results. The second recommendation for the future studies is to work on other language proficiency levels—elementary, upper-intermediate, and advanced. The third suggestion is that the next studies are recommended to conduct similar topics in other geographical areas. Finally, future researches are offered to check the impacts of massed and spaced instructions on other skills and subskills of language.

To sum up, the findings of this study demonstrated that spacing instruction leads to better learning than massing instruction. The findings revealed that spacing group had better performance on reading comprehension posttest thanks to spacing instruction. From the obtained findings, it can be concluded that learning through spaced distribution instruction gives the learners a better opportunity to retain an adequate amount of knowledge gained from instruction until the next chance for review blooms, either accidentally through input, explicitly via additional instruction, or through the necessity to utilize the specific item in speaking, reading, or writing Miles (2014).

**Authors’ Note**

Please contact author for data requests.

**Author Contributions**

Ehsan Namaziandost carried out the study. 40 participants participated in the study. Fariba Rahimi Esfahani carefully read the article and revised it.

**Declaration of Conflicting Interests**

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