

Distribution of Instructional Time in Secondary, Non-Intensive Thai EFL Classes: Effects on Grammar Acquisition

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Abstract

In order to bring clarity to the optimal distribution of instructional time in non-intensive EFL grammar courses, this study investigates whether 3.5 hours of weekly instructional time should be massed (a single session once a week) or distributed (short, daily sessions). A quasi-experimental design with pre-test, immediate post-test and delayed post-tests was used to measure gains on a range of eight grammar topics. The exams included two grammar tasks at varying levels of conceptual difficulty. Results show that distributed practice produced significantly higher results on immediate post-tests. Distributed practice also resulted in higher scores on the delayed post-test although the difference was less outstanding. Performance on tasks of varying conceptual difficulty was affected equally by massed and distributed practice. These findings can inform decisions regarding the scheduling of weekly instructional time for optimal outcomes in non-intensive grammar courses. Short, daily instructional sessions are more beneficial to achieve language gains for short- and long-term recall than long sessions held once a week.

1 Introduction

In order for a learner to master any new skill, an investment of time for practice is essential. Becoming fluent in a second language demands a substantial amount of practice time. In answer to precisely how many hours are needed, ‘the more the better’ is a simplistic idea that leaves many questions regarding practice time unanswered. When designing a course, it is inevitable that decisions be made about the frequency and length of instructional sessions. Too often, these decisions are based merely on convenience and pre-arranged class period allocations ignoring research which has shown that the way in which instructional time is distributed can have significant effects on language gains (Cepeda et al., 2009; Stern, 1985; Wallinger, 2000).

In non-intensive EFL courses in Thai secondary schools, for example, students commonly receive approximately 3.5 hours of instructional time per week. While this type of language course is considered by many to be ineffective for reaching fluency in English (Collins & White, 2011; Netten &

Germain, 2004; Rifkin, 2005), most students in Thailand as well as in many other outer circle countries still receive most, if not all, of their English instruction in such courses. The distribution of this small amount of weekly instructional time for achieving highest possible language gains needs further research.

Previous studies on the distribution of instructional time are not in agreement on whether instructional time should be massed (concentrated) or distributed (spread out) over a longer period of time. Studies in the field of cognitive psychology have repeatedly found robust evidence for a phenomenon known as the spacing effect where higher gains are achieved when total instructional time is separated by one or more gaps as opposed to being carried out in one continuous session (Dempster, 1988). These studies, first conducted in memory labs, have been cautiously extended into classroom-like learning environments. In a recent review of such studies, Rohrer (2015) concludes that distributing instructional time over a longer rather than shorter period of time results in increased post-test scores. However, the second language acquisition (SLA) studies included in Rohrer's review only measured gains on discrete language items (e.g. vocabulary building and a narrow range of target grammar points) with treatment periods of only a few hours. Stark differences remain between these studies and authentic language learning programs. As a result, the relevance of findings from such studies for language programs has been questioned (Serrano, 2011).

In contrast, another set of research concerned more with overall fluency and complex language tasks (Collins & White, 2011; Serrano & Muñoz, 2007; Serrano, 2011; Spada & Lightbown, 1989; White & Turner, 2005) argues that massed practice (intensive courses) yields higher language gains than distributed practice (non-intensive courses). However, most of these studies lack a delayed post-test, which is a significant gap due to the fact that the benefits of distributed practice are far more pronounced for long-term retention (Rohrer, 2015). Many of these studies are also known to suffer from confounding variables and inconclusive findings (Collins & White, 2011).

Standing somewhere between well defined, concise memory tasks measured in many cognitive psychology studies and the more complex, global proficiency nature of the language program studies is grammar competence (Bird, 2010). Mastery of a wide range of grammar points is crucial for the success of Thai secondary students on standardized tests and university entrance exams. The effect of time distribution on gains in a set of grammar skills needed for such exams is still largely unexplored (Miles, 2014).

Therefore, the present study is concerned with finding the optimal distribution of 3.5 hours of weekly instructional time for learning a range of grammar items as measured on an immediate post-test and a delayed post-test. This study also sought to discover how performance on grammar tasks of varying conceptual difficulty is affected by distributed versus massed practice. Findings from this study can inform course schedule planning to maximize success in non-intensive EFL grammar courses.

2 Literature review

2.1 The spacing effect in cognitive psychology research

Discussion of the spacing effect started with Ebbinghaus (1885/1913). Since that time a large amount of research has been conducted to determine its strength and reach. According to this theory, skills are better learned and retained when a practice period is spaced with intersession intervals rather than occurring in one uninterrupted session. The superior outcome of spaced (distributed) practice has been consistently observed for a wide range of skills including a few related to SLA such as: vocabulary building (Küpper-Tetzel, Erdfelder, & Dickhäuser, 2014), reading comprehension (Reder & Anderson, 1982), text processing (Seabrook, Brown, & Solity, 2005) and grammar learning (Miles, 2014).

Evidence for the benefits of gaps between instructional sessions leads to questions concerning the length of intersession intervals. According to Pimsleur's (1967) graduated interval recall theory, a

learner needs frequent subsequent exposures soon after material is first presented followed by additional exposures at increasingly longer intervals. Various scholars have investigated the impact of varying intersession intervals on skills acquisition (Bird, 2010; Cepeda, Pashler, Wixted, & Rohrer, 2006; Rohrer & Pashler, 2007). They have found that the optimal length of intersession intervals (ISI) depends on the length of time between the final session and the test, also known as the test delay or retention interval (RI). In other words, in order to determine the length of ISI, one should first determine how long they wish to retain the knowledge or skill being learned. Based on their research, Cepeda et al. (2006) proposed that ISI should be roughly 10% to 30% of the RI, a finding supported by Bird and Rohrer & Pashler. For example, if RI is 10 days, 1–3 days would be the optimal ISI. Long ISIs are beneficial for long-term retention provided that what has been learned can still be recalled when subsequent learning sessions occur (Rohrer, 2015).

2.2 *Defining massed and distributed practice*

Massed practice, as defined in the cognitive psychology studies, is a condition where the entire chunk of instruction is given in one continuous session (Dempster, 1988). Since no language program follows purely massed practice, the relevance of cognitive psychology studies on time distribution to foreign language programs has been questioned (Serrano, 2011). According to Rohrer (2015), every language program is a variation of distributed practice. In spite of this, there have been repeated calls to extend studies on the spacing effect (massed versus distributed practice) from a laboratory environment into more authentic language learning contexts (Bird, 2010; Dempster, 1988; Miles, 2014).

In fact, when going about language learning, it is possible to imagine a wide range of time schedules including various lengths of study sessions, intersession intervals, test delays and overall instructional periods. The terms massed and distributed practice, then, have been borrowed from cognitive psychology and are used to describe conditions where instructional time is relatively more concentrated (massed) or spread out (distributed) over a period of time. For example, in a well-referenced study by Collins, Halter, Lightbown and Spada (1999), massed practice is used to refer to an intensive program where instructional time was concentrated into a 5-month versus a 10-month period. This definition of massed practice sharply contrasts that used in a study by Miles (2014) where the same term refers to a condition in which 65 minutes of instruction is given non-stop (a pure form of massed practice). Therefore, since these terms are relative, caution must be taken when comparing the results of various studies on instructional time distribution.

2.3 *The spacing (distributed practice) effect in foreign language programs*

Most time distribution studies done so far on foreign language programs offer results that appear to conflict with the cognitive psychology studies mentioned in Section 2.1. They have found that students in massed practice (intensive programs) achieve slightly greater gains than students in distributed practice (extensive programs) when the total hours of instructional time remain constant (Collins et al., 1999; Collins & White, 2011; Serrano, 2011; Serrano & Munoz, 2007; Spada & Lightbown, 1989; White & Turner, 2005).

For example, Serrano (2011) compared two different distributions of 110 hours of instructional time with intermediate and advanced level students. The distributed practice group studied 2 hours per week for 7 months while the massed practice (intensive) group studied 25 hours per week for 4.5 weeks. The results of an immediate post-test showed that massed practice resulted in higher gains in grammar, vocabulary knowledge, listening and writing skills for intermediate level students. However, this study lacked a delayed post-test which is a significant gap due to conclusions from cognitive psychology studies which posit that distributed practice yields greater benefits primarily for long-term retention.

In addition to the lack of delayed post-tests, many of the studies done so far in foreign language programs suffer from a lack of strict control of confounding variables. Spada & Lightbown (1989) compared two groups with differing initial proficiency levels. In the study by Collins et al. (1999),

students in the massed group had substantially greater opportunities to use English outside the classroom. Furthermore, students with higher academic performance are generally more likely to be admitted into intensive programs (massed practice) which could account for their higher success rate in comparison to regular programs (distributed practice) (Rice, Udagawa, Thomson, & McGregor, 2008).

These studies also lack clear, unambiguous results. Advanced learners in the Serrano (2011) study did not attain higher gains in massed practice as did their intermediate counterparts. In a study by Xu, Padilla and Silva (2012) in an intermediate level Mandarin context, 80+ hours of instruction were given across a 22-week semester and a 4-week intensive course. In contrast to Serrano, this study showed no difference in gains in oral comprehension, vocabulary, pronunciation and grammar usage as a result of massed versus distributed practice.

In spite of these challenges, the general consensus of researchers observing language learning programs is that intensive programs are more effective for improving overall proficiency in English. Therefore, how research on the spacing effect from the field of cognitive psychology can inform scheduling decisions in foreign language study programs remains unclear.

2.4 Comparing the two sets of research

A commonly referred to explanation for the discrepancy between the two sets of research mentioned above is the marked difference in the tasks measured to indicate language gains in terms of their conceptual difficulty level (Bird, 2010; Serrano, 2011). The cognitive psychology studies have often been conducted in laboratory environments using concise, well-defined tasks (e.g. memory of word lists or concrete facts) that require minimal cognitive processing. Even the studies that have attempted to cross over into language learning environments are usually focused on a narrow range of grammar or vocabulary building skills. On the other hand, studies of foreign language programs often measure highly cognitive and conceptually difficult tasks such as writing and general communication.

Results of a study by Donovan and Radosevich (1999) show that the benefits of distributed practice decrease with an increase in the complexity of a task. In other words, when learning a list of words (low conceptual difficulty) the positive effect of distributed practice is greater than it is for puzzle solving skills (high conceptual difficulty). In conclusion of his research giving evidence for the benefits of distributed practice for learning grammar concepts, Bird (2010) points out that these results cannot be easily compared to studies measuring global proficiency and it is possible that the ability to produce grammatically correct sentences in conversation could benefit from massed practice.

As mentioned in Section 2.3, another noteworthy difference in the two sets of research is the lack of delayed post-tests in the studies on foreign language programs. Most of the cognitive psychology studies do not claim superior outcomes on immediate post-tests since it is only on delayed post-tests that the benefits of distributed practice become evident. Therefore, it is possible that if delayed post-tests were included in a study of distributed practice in a foreign language program, the perceived benefits of massed practice would disappear.

2.5 Time distribution research with a focus on grammar acquisition

A few recent studies are similar to the present study in that they measured the effects of distributed practice on grammar gains with an attempt to closely control all confounding variables (Bird, 2010; Miles, 2010; Miles, 2014; Year & Gordon, 2009).

Year and Gordon (2009) conducted a study comparing three groups of Korean middle school students. One group received 200 minutes of instructional time over a 4-day period (massed practice). The two remaining groups received the same amount of treatment in spaced distribution treatment following 4-week or 8-week study schedules. Elicited production and acceptability judgement tasks

were used to measure students' acquisition of the English ditransitive verb construction. Both distributed practice groups outperformed the massed group on the immediate post-test as well as on a 6-week delayed post-test used to measure longer-term retention.

In a study by Miles (2010), two grammar points, namely, word order of frequency adverbs and *almost* as an adverb, were taught explicitly to 55 Korean undergraduate students. The massed group received one continuous 60-minute lesson and the distributed group received 4 shorter lessons with a total of 60 minutes of instructional time spread out over a one month period. The results show that the distributed group significantly outperformed the massed group ($p < .05$) on error recognition/correction tasks as well as translation tasks on a 6-week delayed post-test. A similar study was conducted four years later (Miles, 2014) which included an immediate post-test to measure the effects of massed versus distributed practice on surface level gains. Results indicated equal gains in both experimental conditions on the immediate post-test, however, the benefits of distributed practice for longer-term retention were again evident by significantly higher scores on a 5-week delayed post-test.

Bird (2010) compared two groups of students who spoke Malay as their native language that received roughly 5 hours of instructional time at 3-day and 14-day ISIs. The grammar focus in this study was on learning simple past, present perfect and past perfect tenses. Instruction was given using isolated, form-focused materials. Error recognition and correction exercises were used in assessment. The purpose of the study was to investigate the relationship between ISI and RI. The findings indicate that there was little difference between the groups on immediate post-tests, however, gains made in massed practice declined sharply on the 60-day delayed post-test while gains made in distributed practice were significantly more durable.

While these studies shed some light on the acquisition of decontextualized grammar, doubts remain as to whether the results can be applied to non-intensive EFL grammar courses for two reasons. Firstly, each of these studies focused on a very narrow range (maximum of three) of grammar concepts. Students preparing for high stakes exams need to master a wide range of grammar skills. It is possible that a course including a range of grammar points would more closely resemble the studies on general proficiency where there is less evidence for the advantages of distributed practice (Miles, 2010). A second and more important limitation of these studies is a treatment period which is far shorter than any normal language course. The longest treatment period in the four studies reviewed in this section was only 5 hours. A few of these studies compared purely massed practice with distributed practice. As was mentioned in Section 2.2., no language program employs purely massed practice. Therefore, these studies are unable answer the question as to whether weekly instructional time in an authentic grammar course designed for high stakes exam preparation should be massed or distributed.

The purpose of the current study is to further clarify the effects of distributed versus massed practice for grammar gains in foreign language programs. The length and quality of the treatment as well as the range of target grammar items was chosen to reflect authentic EFL language learning conditions in a Thai secondary school.

2.6 Research questions and hypothesis

This study sought to answer the following research questions:

1. When given 3.5 hours of weekly instructional time over a period of 8 weeks, what are the effects of distributed versus massed practice on grammar gains in immediate post-tests?
2. When given 3.5 hours of weekly instructional time over a period of 8 weeks, what are the effects of distributed versus massed practice on grammar gains in delayed post-tests?
3. Is performance on grammar tasks of varying conceptual difficulty equally responsive to distributed versus massed practice?

Based on the findings from previous studies, we can expect to find equal gains between both groups on immediate post-tests. However, the gains made by the distributed group should be more resistant to decay. This prediction is moderated though by the fact that students are tested on a range of grammar items which requires a higher level of cognitive processing, a condition known to be less effected by distributed practice. Distributed practice is expected to provide less benefits for grammar tasks with higher conceptual difficulty (error recognition/correction) than for those of lower conceptual difficulty (multiple choice).

3 Methods and design

3.1 Participants and context

60, Grade 9, low-proficiency students were the participants in this study. There were 7 males and 53 females, all of which were 14 or 15 years of age. The participants were enrolled at a private Islamic school in deep southern Thailand, a region where English is not widely used. English is a compulsory subject in the Thai basic education core curriculum starting from Grade 1; consequently, they have already studied English in school for at least eight years. None of the participants were enrolled in the intensive English program at their school. In addition to the treatment, students also took their regular English classes during school hours which consisted of 3.5 hours of instruction weekly.

In order to recruit participants, sign-up sheets were posted in four different Grade 9 classrooms. Students voluntarily signed up for classes held outside of regular school hours. They also chose their preferred study timetable which determined whether they were part of the massed or distributed experimental group.

To ensure that both groups were on the same level prior to treatment, the results of the pre-tests were analyzed with an independent samples t-test. Although the massed group scored a bit higher, the difference was not statistically significant. Therefore, both groups were considered to be at an equal proficiency level in regard to target language items.

3.2 Grammar selection and instructional materials

Thai students in Grade 9 are preparing for several high stakes tests at the end of the academic year, a substantial part of which contains isolated grammar items. Grammar items on exams from previous years were observed and eight grammar points were chosen, all of which appeared in more than one of those tests. Based on the researcher's experience after teaching in Thailand for 5 years, preference was given to grammar points which were frequently found to pose a problem for Thai students. The eight grammar points chosen, one as the focus for each week of treatment, were the following:

1. Past continuous versus past simple tense
2. Comparative and superlative adjectives
3. If / unless + first conditional
4. Question tags
5. Active voice versus passive voice
6. Present perfect simple tense
7. Direct speech versus indirect speech
8. Gerunds and infinitives

Lesson plans were created using a combination of form-focused instruction and communicative activities. (See Appendix A for a sample lesson plan.) The sole use of explicit grammar teaching has been shown to be less effective in SLA (Krashen, 2003). However, since the exam was made up of isolated grammar items in imitation of Grade 9 level standardized tests, it seemed rational to incorporate some explicit grammar instruction into the lessons. Both groups were taught by the researcher using identical content and lesson sequence.

3.3 *Experimental conditions*

Each group had 3.5 hours of instructional time per week for a period of 8 weeks with a total of 28 hours of instructional time. For both groups, one of the eight grammar points was presented each week. After the first week, grammar points already taught in the course were reviewed at the beginning of subsequent sessions.

The only difference between the groups was the distribution of 3.5 hours of weekly instructional time throughout each week (see Table 1). In the massed group this weekly amount of instructional time was massed into a single session whereas in the distributed group it was distributed across 6 sessions. Therefore, the two differences between massed and distributed practice in this study were the length of intersession intervals (6 days in the massed condition versus 1 day in the distributed condition) as well as the length of instructional sessions (3.5 hours in the massed condition versus 35 minutes in the distributed condition). For the massed group a 15-minute break (not included in the total 3.5 hours) was given in the middle of each study period.

Regular classes are held 6 days a week at the school where the research was conducted with Friday being the only day of the week that the school is closed as is common in Islamic schools in deep southern Thailand. Students in the massed group agreed to come to school on Friday mornings for 3.5 hours of instruction during the treatment period while students in the distributed group agreed to stay for 35 minutes after each school day for their instruction.

It is important to note that the massed condition in this study does not follow purely massed practice in cognitive psychology terms. Instruction that occurs within a single continuous study session without subsequent review has long been proven to be ineffective for skill acquisition and is not true of either condition in this study.

Table 1. Weekly study timetable

Day	Distributed group instructional time	Massed group instructional time
Wednesday	35 min.	-
Thursday	35 min.	-
Friday	-	3.5 hours
Saturday	35 min.	-
Sunday	35 min.	-
Monday	35 min.	-
Tuesday	35 min.	-
Total	3.5 hr. (210 min.)	3.5 hr. (210 min.)

3.4 *Procedure and assessment*

A pre-test, immediate post-test and delayed post-test design was followed for this study. Both groups took the pre-test on the day before treatment began. The immediate post-test was administered to both groups on the day after treatment ended which was one day after the final session for the distributed group and five days after the final session for the massed group. The delayed post-test was taken by both groups exactly one month after the immediate post-test. All exams were announced in advance and students were allowed two hours to complete each exam.

Table 2. Exam item details

Topic	Exam type	
	ER/C	MC
1. Past continuous versus past simple tense	5	5
2. Comparative and superlative adjectives	5	5
3. If / unless + first conditional	5	5
4. Question tags	5	5

5. Active voice versus passive voice	5	5
6. Present perfect simple tense	5	5
7. Direct speech versus indirect speech	5	5
8. Gerunds and infinitives	5	5
Total	40	40
	80	

The pre-test, immediate post-test and delayed post-tests were identical. This exam had a total of 80 items made up of two parts, each with a unique type of grammar task (see Table 2). The first part was error recognition/correction tasks (ER/C). One or two sentences were given for each item with four underlined words, one of which was grammatically incorrect. Students received one point for identifying the error and one additional point if they were able to fix the error correctly. The second part was multiple choice tasks (MC). Students merely needed to choose the correct answer to fill in the blank in each item. Students were awarded one point for each correct answer. (See Appendix B for sample exam items.) These two types of grammar tasks represented two levels of conceptual difficulty. The ER/C task was considerably more difficult due to students being required to produce words or phrases that were grammatically correct. Both types measured students' ability to perform discrete, decontextualized grammar tasks such as are commonly found on high stakes English exams taken by Thai secondary students.

Each part of the exam consisted of 40 items made up of five items from each of the eight grammar points. Total points for the entire exam was 120. Prior to their use in this study, all test items were piloted with a separate group of Grade 9 students and found to be reliable.

4 Results

4.1 Effects of distributed versus massed practice on immediate post-tests and delayed post-tests

Table 3 shows descriptive statistics for the scores of both groups on the pre-test, immediate post-test and delayed post-test. The scores displayed in this table are the total of both exam types. On the immediate post-test, both groups made significant gains from the pre-test. The increase from pre-test to immediate post-test for the distributed group was 55.4 points, while the increase for the massed group was only 38.4 points.

Table 3. Descriptive statistics for pre-test, immediate post-test and delayed post-test (total of both exam task types)

	Distributed (n=30)		Massed (n=30)		Sig.
	Mean	S.D.	Mean	S. D.	
Pre-test	27.70	8.75	31.93	9.68	.081
Immediate post-test	83.13	17.91	70.30	23.38	.020*
Delayed post-test	76.97	18.05	69.07	22.63	.140

* significant at $p < .05$

The distributed group scored 12.8 points higher than the massed group on the immediate post-test. In order to answer the first research question, an independent samples t-test was conducted to find the difference between the means of both experimental groups on the immediate post-test. The results showed that the distributed group scored significantly higher on this test than the massed group ($p < .05$) with a large effect size ($d = .62$; see Fig. 1).

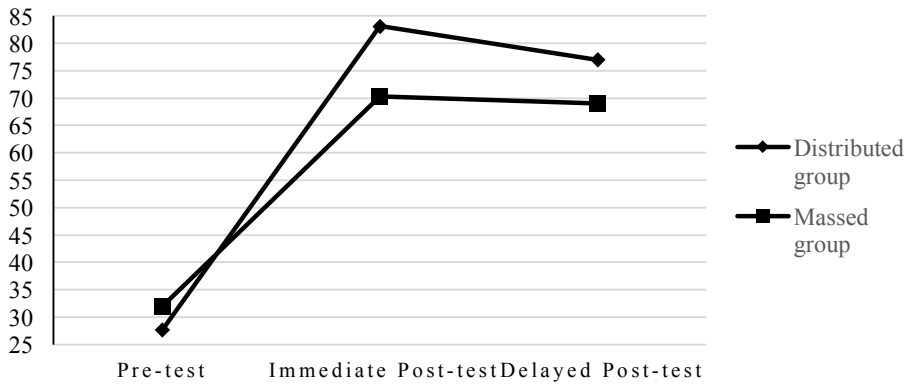


Figure 1. Total scores on pre-test, immediate post-test and delayed post-tests.

On the delayed post-test the distributed group outperformed the massed group by 7.9 points. When comparing delayed post-test scores with immediate post-test scores within groups the massed group only lost 1.2 points while the distributed group had a greater loss of 6.1 points.

In order to answer the second research question, another independent samples t-test was conducted to find the difference between the means of both experimental groups on the delayed post-test. The results showed that although the distributed group still outperformed the massed group on this test, the difference in mean scores ($p = .14$) failed to reach statistical significance at $p < .05$ level.

Furthermore, a paired samples t-test was conducted to shed light on the rate of decline in scores from the immediate post-test to the delayed post-test within groups. When total scores including both exam task types were taken into consideration, the declines were statistically insignificant for both experimental groups.

4.2 Comparison of effects of distributed and massed practice on performance in two grammar task types

In order to answer the third research question, the exam scores were divided by exam task types and analyzed independently (see Table 4). Paired samples t-tests were conducted to find the effect of distributed versus massed practice on the increase and decline of scores on both exam task types.

On the immediate post-test, the superior gains made by the distributed group in comparison to the massed group were equally significant ($p < .05$) for both task types. The differences on scores from the delayed post-tests between groups were statistically insignificant for both task types.

Table 4. Descriptive statistics for immediate post-test and delayed post-test by exam type

		Distributed (n=30)		Massed (n=30)		
		Mean	S.D.	Mean	S.D.	Sig.
Immediate post-test	ER/C	53.40	13.98	43.97	16.81	.021*
	MC	29.73	4.70	26.33	7.13	.034*
Delayed post-test	ER/C	49.47	13.35	43.80	16.09	.143
	MC	27.50	5.32	25.27	7.22	.178

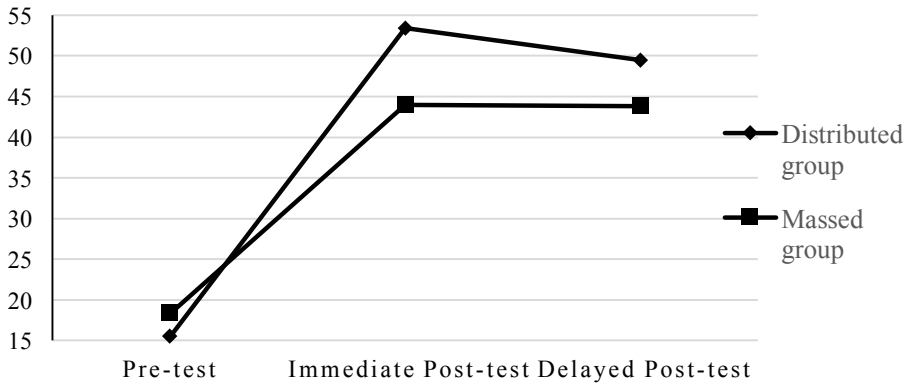
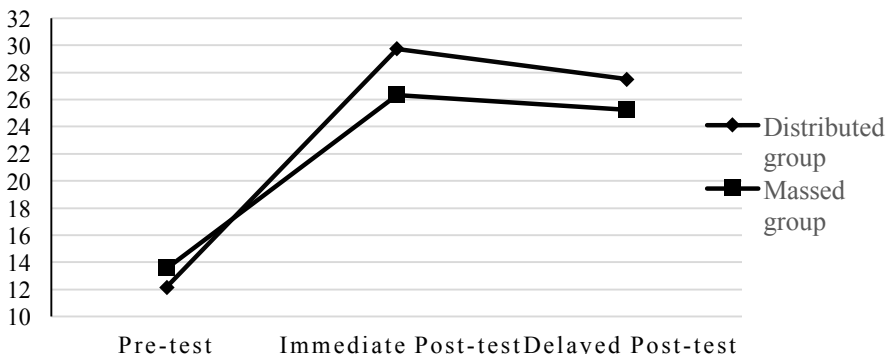
*significant at $p < .05$

When considering the rate of decline in scores from immediate post-test to the delayed post-test within groups, the distributed group had statistically significant losses ($p < .01$) on both ER/C and MC tasks. The massed group did not have a statistically significant loss on either task type (see Table 5). These results indicate that performance on grammar tasks on both levels of conceptual difficulty was equally affected by distributed and massed practice (see Fig. 2 and 3).

Table 5. Descriptive statistics for the decline in scores from immediate post-test to delayed post-test

		Immediate post-test		Delayed post-test		Sig.
		Mean	S.D.	Mean	S.D.	
Distributed group	ER/C	53.40	13.98	49.47	13.35	.002**
	MC	29.73	4.70	27.50	5.32	.001**
Massed group	ER/C	43.97	16.81	43.80	16.09	.906
	MC	26.33	7.13	25.27	7.22	.134

**significant at $p < .01$

**Figure 2. Scores on pre-test, immediate post-test and delayed post-tests for ER/C tasks.****Figure 3. Scores on pre-test, immediate post-test and delayed post-tests for MC tasks.**

5 Discussion

In regard to the first research question (effects of distributed versus massed practice on immediate post-tests), the results from this study show that the distribution of instructional time has significant effects on grammar learning for short-term recall. On immediate post-tests, participants benefited significantly from distributed practice. This lends support to previous studies which have suggested that the benefits of distributed practice found in cognitive psychology studies on the spacing effect are relevant to language learning programs (Miles, 2014; Seabrook et al, 2005).

The results of this study contrast with the studies of foreign language programs, most of which have found superior gains in massed (intensive) instruction (Collins et al., 1999; Collins & White, 2011; Serrano, 2011; Serrano & Munoz, 2007; Spada & Lightbown, 1989; White & Turner, 2005).

It is worth repeating the ways in which this study differs from those done on foreign language programs as these differences may account for the contrasting outcomes. In addition to the fact that this study measured only grammar gains in isolated, decontextualized tasks as opposed to overall second language proficiency, the distributed practice condition in this study also differs from the distributed practice condition in the foreign language program studies. Only students in the distributed group in this study had daily instructional sessions, a characteristic of the massed condition of the foreign language program studies. It is possible that frequent daily practice, albeit in small amounts, is the common factor for the success of intensive language programs and that of distributed practice in non-intensive programs such as the one in this study.

This study found significant benefits of distributed practice for performance on immediate post-tests unlike a few recent studies on the spacing effect in grammar learning (Bird, 2010; Miles, 2014; Year & Gordon, 2009), all of which reported nearly equal performance on immediate post-tests by students in distributed and massed conditions. As mentioned before in section 2.5, those studies focused on a very narrow range of grammar points (maximum of three) and had a short treatment period (less than 5 hours total). While other studies have found that distributed practice results in higher scores in delayed post-tests, the results of this study show that when the treatment is extended in terms of overall time and in the range of grammar topics, the benefits of distributed practice become apparent for immediate post-tests as well.

When analyzing the results of the immediate post-test in comparison with the delayed post-test within groups, less decay was observed in the massed group than in the distributed group. However, the distributed group maintained higher scores in relation to the massed group on both exams. In regard to the second research question, then, the results of this study confirm the benefits of distributed practice for higher scores on delayed post-tests. This adds strength to previous studies which have investigated the effects of distributed versus massed practice on grammar gains in closely controlled experiments with shorter amounts of instructional time and a narrower range of grammar focus (Bird, 2010; Miles, 2010, 2014; Year & Gordon, 2009) and suggests that findings from such studies can be applied to more authentic language learning programs.

On the other hand, it is important to note the lack of statistical significance in the difference between mean scores on the delayed post-test. This indicates that the benefits of distributed practice over massed practice in this study were weaker for long-term retention than they were for short-term recall.

In regard to the ISI/RI ratio presented by Bird (2010), the results of this study show that study conditions with ISI/RI ratios well outside of the suggested optimal ratio of 10 to 30% can still be effective for short- and long-term recall. In this study, the delayed post-test of the massed group is the only condition that falls within the proposed optimal ISI/RI ratio (see Table 6). Students in this condition, however, had lower scores than students in the distributed group where the ISI was only 3% of RI. The ratios presented in Bird's study likely have relevance to the frequency at which target language points are presented throughout a course but may have little to offer in terms of how instructional sessions should be scheduled over a period of time.

Table 6. Ratios of intersession intervals to retention intervals

	Immediate post-test	Delayed post-test
	Massed = 5-day RI Distributed = 1-day RI	Massed = 35-day RI Distributed = 30-day RI
Massed (6-day ISI)	120%	17%
Distributed (1-day ISI)	100%	3%

In regard to the third research question, this study found that distributed versus massed practice had equal effects on two tasks of varying conceptual difficulty. This contrasts with the study by Donovan and Radosevich (1999) which found greater benefits of distributed practice for tasks of lower conceptual difficulty. On the other hand, this finding confirms the claims of a few researchers who have suggested that the benefits of distributed practice (i.e. spacing effect theory) are not isolated to

tasks requiring lower cognitive processing (e.g. memorization tasks) but are also relevant to those tasks which require a higher level of cognitive processing (e.g. editing tasks) (Bird, 2010; Miles, 2014).

6 Conclusion

There is growing evidence that the spacing effect theory has implications for real-life language courses. This study was conducted in an authentic non-intensive secondary grammar course and found that when there is an allotted schedule of a few hours of weekly instructional time, the distribution of that instructional time over the course of a week is important for short-term and long-term recall on grammar tasks of varying conceptual difficulty levels. In light of the superior gains on immediate and delayed post-tests, course designers and students preparing for high stakes exams should pay attention to the need for a weekly schedule that distributes instructional time across a number of days. Although these frequent instructional sessions may be short, this type of scheduling yields greater results than when those few hours are crammed into a single day.

The results of this study also have implications for the sequence in which content is presented throughout a language course. Instructors who find themselves teaching grammar in massed scheduling conditions should incorporate elements of distributed practice in their lesson plans. For example, rather than focusing on one grammar topic for the duration of a long instructional session, class time should be divided into segments each with a unique grammar topic or type of task. Grammar topics taught earlier in the course should be reviewed frequently. If a target grammar point is only taught during one or a few closely concentrated study sessions and not reviewed later in the course, it is less likely to be remembered. Frequent and repeated exposure to target content will result in faster learning.

6.1 Limitations and recommendations for further research

Studies on how spacing effect theory applies to real life language classrooms have just begun. Among many possible distributions of weekly instructional time, this study only took two into account. A study schedule where students have short daily learning sessions may be impractical in some cases. Distributing 3.5 hours of study time over two days per week may be equally beneficial but needs further research.

This study found that the decline in retention from immediate post-tests to delayed post-tests of the distributed group was slightly steeper than that of the massed group. If that rate of decline continues after another month the benefits of distributed practice may disappear. Another delayed post-test held at the end of 2 or 3 months could shed more light on how well knowledge is retained after instruction in distributed versus massed practice for longer term recall.

Finally, this study considered only two tasks of varying degrees of conceptual difficulty, both of which were grammar-related tasks. This represents a narrow range of task conceptual difficulty. Overall language proficiency requires a higher level of cognitive processing than do editing tasks. Therefore, the possibility remains that when a greater range of conceptual difficulty is taken into consideration, performance may vary as a result of distributed versus massed practice. It is also possible that the benefits for distributed practice found in this study would not be found on tasks of higher conceptual difficulty, for example, communicative tasks or discourse level writing tasks.

References

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	<p>having student give the correct form of the verb that follows.</p> <ul style="list-style-type: none"> Write the first three sentences of paragraph 3 on the board. Demonstrate how to change these sentences into negative sentences. <ul style="list-style-type: none"> Students choose two more sentences from the story and change them into their negative form. Teacher monitors and helps with problems. Students complete the grammar exercise to reinforce present simple (M302). After students are finished, teacher calls random students to read their answers. Check for accuracy. Put three columns of words on the board (M303). Students use words from the list to make three true sentences. 	Ss	5 min.
		Ss	5 min.
		Ss	6 min.
		Ss	
2	<p>Review simple future tense</p> <ul style="list-style-type: none"> Ask students what they will do this afternoon. Write a few of their responses on the board. Then ask what they won't do and write a few of their responses on the board. Draw attention to the form of simple future tense. Also review the question form. Students get into pairs. They ask each other what is one thing they will do when they are fluent in English. Encourage them to keep it simple. Then teacher calls on a few random students to report on what their partner will do when they are fluent in English. Tell students to imagine that they have been living in a foreign country for one year. Now they are ready to go back to Narathiwat. Make a list of 4 things that you will do when you arrive in Narathiwat. <ul style="list-style-type: none"> After students have written their responses, teacher calls on random students to read their answers to the class. Have the students change the sentences they have written into question form and negative form. Teacher monitors and helps with problems. 	Ss > T T > Ss	5 min.
		Pairwork Ss > T	7 min.
		Ss	6 min.
		Ss	5 min.
		Ss > T	10 min.
		Ss	
3	<p>First conditional</p> <ul style="list-style-type: none"> Explain that some of our future plans are dependent on other circumstances. Elicit two things that students plan to do tomorrow. Suggest something that each of these plans are dependent on. Use this information to write two first conditional sentences on the board. (Example: I will go to school tomorrow if I don't get sick.) Draw attention to the 'if clause' versus the 'main clause'. Students get into pairs. Give each pair a set of paper slips (M304). Students match two halves of the sentence to make conditional sentences. Teacher monitors. When students finish the rearrange the slips to make the sentences wrong. Then they switch with another group and correct those sentences. Cut the sentences into individual words. Give each pair three sets of paper slips (M305). Students put the words in order to make first conditional sentences. Call on random students to read their sentences to check for accuracy. 	T > Ss	8 min.
		Pairwork	7 min.
		Pairwork	8 min.
		Pairwork	10 min.

	<ul style="list-style-type: none"> Grammar exercise (M306). Students complete the exercise individually. When they finish teacher calls on random students to read each sentence to check for accuracy. 	Ss	
4	<p>More practice with first conditional</p> <ul style="list-style-type: none"> Card game (M307) <ul style="list-style-type: none"> Students get into groups of 4. Each group gets a set of cards. Match the 'if clauses' with the 'main clauses'. If students finish early they can make a new 'main clause' for each 'if clause' or vice versa. Students use the sentence prompts to make four first conditional sentences (M308). Students fill in the blanks with their own ideas to complete the sentences (M309). <ul style="list-style-type: none"> Collect the worksheets. Divide the class into two groups. Teacher reads the answers that a student from Group 1 wrote. Group 2 tries to guess whose answers the teacher is reading. Keep score for a competition between the groups. Teacher points out any mistakes that come up. 	<p>Groups of 4</p> <p>Ss</p> <p>Ss</p> <p>T > Ss</p>	<p>10 min.</p> <p>5 min.</p> <p>18 min.</p>
5	<p>'Unless' in first conditional sentences</p> <ul style="list-style-type: none"> Demonstrate the meaning of 'unless' by rewriting two sentences using 'unless'. (M310) Cut up the slips of paper and give one set to each pair (M311). Students work in pairs to match the two sentence halves. Grammar exercise (M312). Choose 'if' or 'unless' to complete the sentences. When students are finished, teacher calls on random students to read their answers. Check for accuracy. Rewrite sentences by using the word 'unless' but keeping the same meaning. (M313) When students are finished, teacher calls on random students to read their answers. Check for accuracy. 	<p>T > Ss</p> <p>Pairwork</p> <p>Ss</p> <p>Ss</p>	<p>5 min.</p> <p>8 min.</p> <p>10 min.</p> <p>10 min.</p>
6	<p>Production and error recognition</p> <ul style="list-style-type: none"> Conditional chain game. Second student uses the last part of the previous student's sentence as the first part of their sentence. Error recognition exercises <ul style="list-style-type: none"> Show five sentences with errors on the screen (M314). Ask which word in the sentence is incorrect. Teacher elicits a correct sentence and writes it on the board. Grammar worksheet (M315). Half of the sentences contain errors. Students work individually to identify the incorrect sentences and rewrite them correctly. <ul style="list-style-type: none"> When students are finished randomly call on students to read their answers. Check for accuracy and give feedback as necessary. 	<p>Ss</p> <p>T > Ss</p> <p>Ss</p>	<p>10 min.</p> <p>5 min.</p> <p>18 min.</p>