The Relationship between Intelligence and Foreign Language Learning, and the Role of Practice

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Abstract

This study investigates the relationship between intelligence and foreign language learning in general, and the learning of vocabulary and grammar in particular. It also investigates the effect of extra practice on foreign language learning on learners with equal intelligence. The participants were 182 high school students at grades two and three. They were given Raven's Progressive Matrices, which is a test of general intelligence, and an achievement test of English based on their EFL textbook at school. The English test consisted of two subparts: vocabulary and grammar. Correlation coefficient was run on intelligence test scores and English test scores. The results showed a weak positive relationship between intelligence and foreign language learning, and learning of vocabulary and grammar. For investigating the effect of practice, some students who attended English classes and some of those who didn't were chosen in a way that their mean intelligence score was equal. Then their mean English test score was calculated. The mean English test score of the students who attended English classes was significantly higher than those who didn't. These results suggest that intelligence affects foreign language learning, but extra practice can offset the effect of intelligence.

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1. Introduction

As language teachers, we have faced situations in which the same type of instruction in the same class is beneficial for some students and is of little use for others. Considering that the students have received the same instructions by the same teacher, the reason for this variability must lie in the learners themselves. Many personal factors have been found to be effective in second/foreign language learning. Some of these factors have been found to affect language learning either positively or negatively in most situations. For example, motivation is a personal factor which almost always has a positive effect on language learning. Other factors are sometimes positive and sometimes negative factors. For example, anxiety can be both facilitative and debilitative depending on the situation and the level of anxiety.

Intelligence is one of the personal factors which may affect second/foreign language learning. In EFL classes in language institutes, there are some students who come from schools for talented students. These learners, who definitely enjoy a higher intelligence, seem to be better foreign language learners. However, their better performance cannot be solely attributed to their higher intelligence. These students usually receive more instruction and more practice in the form of supplementary materials at their schools.

There is a debate among researchers about the effect of intelligence on language learning. Some scholars believe that intelligence affects language learning, while others believe that these two are not related to each other. What we are sure about is that no negative effect of intelligence on language learning is expected. Some others also believe that intelligence does affect language learning, but it doesn't mean that less intelligent people cannot learn a second/foreign language. They contend that rather than leaving these people on their own as unable to learn a foreign language, we should provide them with more help and guidance.

This study was an effort to help find an answer for this controversy. The aim of this study is to see whether there is a relationship between intelligence and foreign language learning, and if yes, can extra practice on the part of the learners offset the effect of intelligence. However, before dealing with these issues, more details are provided in the next section about different views on intelligence and second/foreign language learning.

2. Review of literature

"Intelligence is the general set of cognitive abilities involved in performing a wide range of learning tasks" (Ellis, 2008, p. 649). It constitutes "a general source of aptitude that is not limited to a specific performance area but is transferable to many sorts of performance" (Dörnyei, 2005, p. 32). The term 'intelligence' has traditionally been used to refer to performance on certain kinds of tests which usually measured linguistic or logical-mathematical

abilities (Brown, 2000). These tests are often associated with success in school, and a link between intelligence and second language learning has sometimes been reported (Candlin & Mercer, 2001). Success in educational institutions and in life in general seems to be a correlate of high intelligence quotient (Brown, 2000). However, the studies similar to that of Candlin and Mercer which investigate the relationship between general intelligence and language learning are few, and Ellis (2008) thinks that this is somewhat surprising. Evidence for this claim about the rarity of such studies comes from Dörnyei's (2005) survey of individual differences research in language learning where he does not mention even one such study.

In relating intelligence to second language learning, can we say simply that a smart person will be capable of learning a second language more successfully because of greater intelligence? According to Brown (2000), it seems that the greatest barrier to second language learning is a matter of memory, in the sense that if you could remember just everything you were taught, or you ever heard, you would be a very successful language learner.

Some researchers believe intelligence to be a component of foreign language aptitude. Sasaki (1996, cited in Dörnyei & Skehan, 2003), for example, examined the relationship between foreign language aptitude and intelligence. At a first-order level of factor analysis (i.e., an analysis based on the matrix of correlations between the different measures), she showed that aptitude and intelligence were distinct. A second-order analysis (i.e., an analysis based on the factor loadings of the first-order analysis), however, did show connections between the two constructs. Interestingly, Sasaki demonstrated that this second-order relationship was strongest for what Skehan (1998, cited in Dörnyei & Skehan, 2003) has termed the "central" component of aptitude, language analytic ability, but that more peripheral components (phonemic processing and memory) were more weakly related to intelligence.

Over the years, many studies using a variety of intelligence (IQ) tests and different methods of assessing language learning have found that IQ scores were a good means of predicting success of second language learners. Some recent studies have shown that these measures of intelligence may be more strongly related to certain kinds of second language abilities than to others. For example, in a study with French immersion students in Canada, it was found that, while intelligence was related to the development of French second language reading, grammar, and vocabulary, it was unrelated to oral productive skills (Genesee, 1976). Similar findings have been reported in other studies. What this suggests is that, while intelligence may be a strong factor when it comes to learning which involves language analysis and rule learning, intelligence may play a less important role in classrooms where the instruction focuses more on communication and interaction (Candlin & Mercer, 2001). Moreover, it is believed that low intelligence and learning disabilities impedes second language learning more in formal learning settings than for immigrant learners and those in immersion settings (August & Hakuta, 1997).

Ellis (2008) cites Ekstrand's (1977, cited in Ellis, 2008) study which showed low-level correlations between intelligence and proficiency as measured on tests of listening comprehension and free oral production, but

much higher correlations were found when proficiency was measured on tests of reading comprehension, dictation, and free writing. Ellis also refers to the study of Genesee (1976) whose results were mentioned above. Ellis then proposes the hypothesis that intelligence is a factor where cognitive academic language proficiency (CALP) is concerned but is less involved where basic interpersonal communication skills (BICS) are concerned. CALP is the proficiency needed to engage in the kinds of context-reduced and cognitively demanding tasks which are mainly found in academic study whereas BICS consists of those skills required for oral fluency and the sociolinguistically appropriate use of language in face-to-face interaction.

Brown (2000) believes that intelligence, in its traditional definition, may have little to do with one's success as second language learner: people within a wide range of IQs have proven to be successful in acquiring a second language. The reason may be related to what was mentioned above about the role of intelligence in classroom language learning and its lack thereof in real-life contexts. Anyway, Brown believes that "language learning IQs" are much more complicated than their traditional definitions (p. 100).

There are alternative views about what constitutes intelligence. Gardner (1993, cited in Richards & Rodgers, 2001) proposed a view of natural human talents that is labelled 'Multiple Intelligences Model". Gardner proposed eight types of intelligences: linguistic, logical-mathematical, spatial, musical, bodily/kinesthetic, interpersonal, intrapersonal, and naturalistic. Gardner maintained that by looking only at the first two categories – which constitute the traditional definitions of intelligence – we rule out a great number of human being's mental abilities; we see only a portion of the total capacity of human mind. Moreover, he showed that the traditional definitions of intelligence are culture-bound. Gardner claimed that his view of intelligence(s) is culture-free and avoids the conceptual narrowness usually associated with traditional models of intelligence.

Another revolutionary view of intelligence is that of Robert Sternberg (1985, 1988, cited in Brown, 2000). Sternberg proposed three types of intelligence: componential ability, experimental ability, and contextual ability. Sternberg believed that too much of psychometric theory is obsessed with mental speed, and therefore, he dedicated his research to tests that measure insight, real-life problem solving, common sense, getting a wider picture of things, and other practical tasks that are closely related to success in the real world.

Another persuasive account of intelligence is Daniel Goleman's Emotional Intelligence (1995, cited in Brown, 2000). This view places emotion at the heart of intellectual functioning. The management of even a handful of core emotions – anger, fear, enjoyment, love, disgust, shame, and others – drives and controls efficient mental or cognitive processing.

The views of Gardner, Sternberg, and Goleman can more easily show us a relationship between intelligence and second language learning in comparison with traditional definition of intelligence (Brown, 2000). Gardner attaches important attributes to the notion of intelligence, attributes that could be crucial to second language success. Musical intelligence could explain the relative ease

that some learners have in perceiving and producing the intonation patterns of a language. Bodily-kinesthetic modes are connected with the learning of the phonology of language. Interpersonal intelligence is of obvious importance in the communicative process. Intrapersonal factors such as motivation, anxiety, self-esteem, inhibition, and others are very effective in second language learning. Even spatial intelligence may assist the second culture learner in becoming comfortable in a new environment. Sternberg's experiential and contextual abilities are important in quick, efficient, unabashed language acquisition. Finally, the EQ (emotional quotient) suggested by Goleman may be very important in accounting for second language success both in classrooms and in untutored contexts (Brown, 2000).

Even if we take it for granted that intelligence, as it is defined traditionally, is related to success in second language learning, and therefore believe it to be a component of language aptitude, there are still some controversies. If we give an aptitude test or an intelligence test to a prospective language learner, such a test clearly biases both student and teacher (Brown, 2000). Both are led to believe that they will be successful or unsuccessful, and a self-fulfilling prophecy is likely to occur. It is better for teachers to be optimistic for students and to monitor styles and strategies carefully, leading the students toward strategies that will aid in the process of learning and away from those blocking factors that will hinder the process (Brown, 2000).

Dörnyei and Skehan (2003) refer to a similar reason for the demise of research on language aptitude in which intelligence may be a component.According to them, aptitude is perceived as anti-egalitarian, in that if a fixed, immutable interpretation of aptitude is taken, it is seen as potentiallydisadvantaging many learners, with no hope offered of overcoming the handicap of low aptitude.

Gass and Selinker (2008) look at the same issue in a different light. According to them, if aptitude measures are used in a way that they discourage individuals from studying foreign languages and if those measures are inaccurate, then certain students will be unfairly prevented from the benefits of knowing other languages. However, if aptitude measures are accurate and students are placed in an instructional program for which they have little aptitude, and if it is possible to either increase their aptitude or place them in another instructional program for which they have greater aptitude, then it is necessary to take students' aptitude into consideration in an educational setting in general and in language classes in particular. Although Gass and Selinker do not mention anything about intelligence, we can generalize their account of aptitude to include intelligence too provided that we can demonstrate that there is a relationship between intelligence and second or foreign language learning.

Considering what is said above, the main purpose of this study is to see whether second or foreign language learners can overcome their intelligence deficits by extra practice and effort. However, before addressing this issue, this study investigates whether there is a relationship between intelligence and EFL achievement on the one hand, and two of language components, namely vocabulary and grammar, on the other. To be more specific, the following research questions are addressed in this study:

1) Is there any positive relationship between intelligence and foreign language achievement?
2) Is there any positive relationship between intelligence and learning the vocabulary of a foreign language?
3) Is there any positive relationship between intelligence and learning the grammar of a foreign language?
4) Can extra practice in foreign language, in the form of attending English classes outside high school, offset the effect of intelligence?

The first research question is included in this study because it is a prerequisite to the fourth question, which is our main concern. If we find no relationship between intelligence and foreign language learning, then the fourth question will be meaningless.

The second and third research questions are included as a subsidiary part of this study. Previous studies have shown both vocabulary and grammar to be related to intelligence (Genesee, 1976). However, we intend to see which of them has a stronger relationship, if any, with intelligence. The rationale for this investigation is that Candlin and Mercer (2001) believe that intelligence is a strong factor in types of learning which involve language analysis and rule learning. On the other hand, Brown (2000) believes that intelligence is related to memory and storing items in the mind. Since grammar is more of a matter of language analysis and rule learning and vocabulary has more to do with memory, the second and third research questions are included in this study to see which of them are more related to intelligence.

In the first three research questions, the term 'positive' is used because we expect to find either no relationship or a positive one. Based on theory and research findings, a negative relationship is not expected. To answer the above research questions, the following method was used.

3. Method

In order to investigate the above research questions, a test of general intelligence and an achievement test of English as a foreign language were administered to 182 high school students. Then the scores obtained on the tests were compared to each other to see whether there is any relationship between them. Details of the method of this study are provided below. Now let us analyze the first advertisement.

3.1. Participants

This study was conducted at an Iranian high school consisting only of female students. The tests were administered in four classes of second-grade students, consisting of 80 students on the whole, and four classes of third-grade students, consisting of a total number of 102. Therefore, there were 182 participants in this study. There were also several more participants who were excluded due to not answering to either of the tests completely. The participants weren't asked about their age because they were expected to be at

a similar age range: 15-16 for second-grade students and 16-17 for third-grade students.

Two of the second-grade classes were majoring at mathematics, while the other two were majoring at humanities. All four classes of third-grade students were majoring at biology. The reason for including these classes in the study was just the fact that one of the teachers of these classes accepted to devote her class time to this study, while no teacher of other classes did so.

The participants were of a very diverse language background. Many of them had never attended an EFL class out of school in their lives. Some of them used to go to an English class but had quit. And some others were going to EFL classes out of school at the time of the study. Those who attended EFL classes were also of very different levels. More details about the participants' language background are provided in the following sections.

3.2. Instruments

The first instrument used in this study was a test of general intelligence called Raven's Standard Progressive Matrices. It is a culture-free, language-free, and nationality-free test of intelligence designed and standardized by J. C. Raven in 1960 (Rajamanickam, 2004). As the name suggests, itis comprised of a set of figural matrices that may be used as a measure of general intelligence (Kamphaus, 2005). It is a fully non-verbal test consisting only of designs and patterns without any verbal statement or indications. This test can be administered to both literates and illiterates (Rajamanickam, 2004). In fact, the Raven's test is a standard for cross-cultural and cross-national studies of intelligence. Given the minimal language involvement and requirement of this item type, this test is particularly suitable for assessing the intelligence of individuals with hearing impairment, language disabilities, and respondents whose native language is not English (Kamphaus, 2005). One important use of this test is measuring intelligence for selection and guidance work. It may cover a wide range of age and ability (Rajamanickam, 2004).

This test has three forms: the Standard Progressive Matrices sets A, B, C, D and E, the Colored Progressive Matrices sets A, Ab and B, and Advanced Progressive Matrices sets I and II (Rajamanickam, 2004). The Standard and the Colored matrices are the most popular ones. The Colored Progressive Matrices include 30 items and the Standard Progressive Matrices contain 60 items. Each item consists of 2×2 or 3×3 figural matrices presented in a multiple choice format where the respondent has to identify the missing element (Kamphaus, 2005).

Reliability data of this test is presented in the 1986Raven manual showing adequate reliability for research purposes, which is the primary use of this measure (Kamphaus, 2005). The re-test reliability of the Progressive Matrices tests was found to be significant at .02 level for all five sets (Rajamanickam, 2004).

Validity evidence for Raven's test extends primarily from correlational studies with other tests. A correlational study with California Achievement Test yielded a coefficient of .76 with the Standard Progressive Matrices. A correlation of .69 was found with the Standard Matrices and WISC-R Full Scale score and .61 between the Colored Matrices and WISC-R Full Scale score for a sample of Mexican American students (Kamphaus, 2005).

Progressive Matrices tests were designed to assess a person's immediate capacity for observation and clear thinking and accurate intellectual work (Rajamanickam, 2004). All the above-mentioned three Progressive Matrices were developed by Raven for different purposes. The Colored Progressive Matrices are intended to be used with young children and old people. The Advanced Progressive Matrices are developed to be used with people above 11 years old and for people who are above the average mental ability. The Standard Progressive Matrices can be used with a wide range of people at any age. The Standard Progressive Matrices is used in this study for the same reason.

The Standard Progressive test consists of five sets A, B, C, D and E. In each set, there are 12 problems, making 60 problems on the whole. In each set, the first problem is the easiest one. Then the problems increase in difficulty progressively. As the respondents work on these problems, they gain some training and they can understand the pattern of arrangement of the problems. Sets A and B have six pieces of designs from which the person has to find out the correct piece which can fit into the pattern. Sets C to E have eight pieces of design to choose the correct one from. Although this scale can be administered to everyone irrespective of age, its author has acknowledged that young children, mentally defectives, and very old people are expected to solve only the problems in sets A and B, and the easier problems in sets C and D and nothing more (Rajamanickam, 2004). The method of scoring is very simple: each correct answer receives one score and there is no correction for guessing. Thus, the minimum score is 0, and the maximum score is 60.

The next instrument used in this study was an EFL achievement test. Two versions of this test were used in this study, one for the second grade and one for the third grade. Of course, the format of both tests was the same. Both tests consisted of 30 multiple-choice items. The multiple-choice format was chosen because of its objectivity and its relative ease in performing statistical analysis.

The items for each grade were chosen from an activity book called Khat-e Sefid which is a series of activity books for high school students. These books consist of different types of questions, including multiple-choice, short-answer, matching and other types of questions. The content of this series is exactly based on the EFL textbook taught at Iranian high schools. In other words, the authors have tried to include no vocabulary and no grammatical point which is beyond the content of the main EFL textbook. These books are easily available in the market but are not obligatory for high school students. Based on the arrangements made with the students' EFL teacher, this book was not used in

the tested classes as an extracurricular activity book. Thus, the researcher made sure that the students were not familiar with the test beforehand. The items were chosen from those parts of the activity book which corresponded to those parts of the textbook already covered in the class.

Each test consisted of 15 vocabulary items and 15 grammar items. There were two reasons for including vocabulary and grammar in these tests and nothing more. The first reason was that vocabulary learning seems to be a matter of memory while grammar needs language processing and rule learning, and we intended to compare these two abilities in relation with intelligence (see Section 2). The next reason was that the tests used at Iranian high schools are far from being authentic. They usually assume language ability to be a combination of different skills and components. From the four traditional language skills, listening and speaking are almost always absent from high school tests. Writing is also rarely used in such tests. The only language skill which is sometimes tested at Iranian high schools is reading comprehension. However, reading comprehension was excluded from this study for two reasons. First, it is time-consuming, so it wasn't possible to test it in the short time that was available to the researcher. Second, the test was intended to be just based on the content of the textbook, and it was not possible to choose a reading passage which was exactly at the same level as the textbook. Considering language components, vocabulary and grammar are almost always used in high school tests. Pronunciation is also sometimes used, but it was excluded from this study because it was believed that testing pronunciation in a written test was not realistic.

In the English achievement tests, each correct item received one point and there was no correction for guessing. Therefore, the potential range of the scores was between 0 and 30.

Another instrument of this study was a short questionnaire attached to the English test answer sheet. This questionnaire was written in Persian in order to avoid any misunderstanding. It asked the participants whether they were attending EFL classes out of school at the time of the study. If yes, they were asked to write down their level. If no, they were asked whether they attended EFL classes before or they had never attended EFL class in their lives. If they had attended English classes before, they were asked to write down how long ago it was and what their level was at that time. This questionnaire was used in order to address the last research question.

3.3. Procedures

As mentioned before, two tests were given to the participants of this study to measure their intelligence and EFL achievement. Both of the tests were administered during one session for each class. First of all, the intelligence test papers and its answer sheets were distributed among the students. They were

told to write down their names on the answer sheets to make it possible to compare their scores with the scores obtained on the English test. However, they were informed that their scores would not be reported to any of their teachers and wouldn't have any effect on their subject matter scores at schools. The time allocation for the intelligence test was 40 minutes. This time was not decided by the researcher. Rather, it was specified on the first page of the test itself.

When the allotted time of the intelligence test finished, the papers and answer sheets of this test were collected and the papers and answer sheets of the English test were distributed. Again, the participants were asked to write down their names and to complete the questionnaire. Though the students were told beforehand to prepare themselves for this test, they were informed at the testing session that their scores in this test would not be reported to their English teacher and would have no effect on their English score at school. Of course, if the participants had been told that their scores in this test would be reported to their English teacher and they would have an effect on their English scores at school, they would have been more motivated and would have answered the test more attentively. But it would have increased their anxiety and the probability of cheating. Therefore, it was decided not to report their scores to their English teacher. The time allocation for this test was 35 minutes, including 5 minutes for completing the questionnaire and 30 minutes for answering the questions.

3.4. Data analysis

After the data was collected from all eight classes in this way, the scores on intelligence test and English test was calculated. As it was mentioned in the previous section, in both tests, each correct answer received one point without any correction for guessing. Besides calculating the score on English test as a whole, the scores on each of its subparts, i.e. vocabulary and grammar, was also calculated. The potential range for each of these subparts was between 0 and 15.

Since the tests were of the so-called objective type, there was no need for rating the test results by two raters, and hence, increasing inter-rater reliability. But the number of correct answers in both tests were counted twice by the same rater in order to avoid any mistakes in counting, and hence, increasing the intra-rater reliability.

After obtaining the scores on the tests, the following correlations were calculated to answer the first three research questions: between intelligence scores and English scores as a whole, between intelligence scores and vocabulary scores, and between intelligence scores and grammar scores. Each of these correlations was calculated for three groups of students: second-grade students, third-grade students, and all students. The rationale for separating second-grade and third-grade students was that the English test given to each group was different from the

other group and this difference might have affected the results. However, since both English tests were exactly based on the content of the students' textbooks, the scores obtained in both tests were comparable to each other. Therefore, a correlation was also calculated on all students.

The statistical analysis used to answer the fourth research question was different from the previous ones. Here the students at each grade were divided into three groups: those who were attending EFL classes outside school at the time of the study (Group C [=currently]), those who had never attended any English classes outside school (Group N [=never]), and those who had attended English classes some time ago but had quit (Group B [=beforehand]). Some of the students who were initially in Group B and had quit English classes very recently, for example, a couple of months ago, were later classified into Group C. Those students of Group B who had quit English classes many years ago and their levels were very low at that time were subsequently classified into Group N. The other members of group B were of such diverse levels and had quit English classes at such diverse times that they could be classified into neither of other groups. Due to this diversity, those students who remained in Group B in the end were excluded from data analysis. There is also a point to be mentioned about Group C. The levels of all members of this group at English classes were higher than the level of their English textbook at school. If there had been some students whose levels at English class were lower than their level at school, they would have been excluded from this group. The reason is that we want to see in this study whether extra practice in English can compensate for low intelligence or not, while studying English at a lower level would provide little practice on the higher-level content of the textbook.

The next step in addressing the last research question was to compare the intelligence scores of students in Group C and Group N. Some students from these groups who had the same or similar intelligence scores were chosen in a way that the mean intelligence score of the groups were exactly the same. The other students were also excluded from data analysis because including them would result in different mean intelligence scores of the two groups.

In the second grade, there were 27 students in Group C and 33 students in Group N at first (and needless to say, there were 20 students in Group B who had been already excluded). After choosing students with similar intelligence scores, 18 students remained in Group C and 18 in Group N. In the third grade, there were 30 students in Group C and 44 students in Group N initially (and 28 students in already-excluded Group B). After comparing intelligence scores, 27 students remained in each group.

The last step in answering the last research question was to compare the means of English test scores in Group C and Group N. The significantly higher mean of Group C would show that going to English classes and more practice in studying English can compensate for not-very-high intelligence because the mean intelligence score of these groups were exactly the same and they were different only in the time they devote to studying English outside school. Whether it was the case or not and whether there was a relationship between intelligence and EFL achievement are presented in the next section.

4. Results

To answer the first research question, which concerns the relationship between intelligence and foreign language achievement, correlation coefficient was calculated between intelligence scores and English test scores of the participants with Pearson formula. This was done for three groups of students: second-grade students, third-grade students, and all students. For second-grade students, the correlation coefficient was .459 which is significant at p<.01 (for all correlations in this study, one-tailed level of significance is considered because we expect to find a positive relationship, if any). For third-grade students, this number was .080 which is not significant at p<.01. The correlation coefficient between intelligence scores and English test scores for all participants of the study was .252 which is significant at p<.01. The results of this part are summarized in Table 1.

Table 1. The correlation coefficients between intelligence scores and English test scores in different groups of participants

Participants group	Number of participants	Correlation coefficient	Significance
Grade 2	80	.459	.000
Grade 3	102	.080	.211
All participants	182	.252	.000

The relationship between intelligence scores and vocabulary scores was also calculated in three groups. In the second-grade group, the correlation coefficient was .384 which is significant at p<.01. In the third-grade group, this coefficient was .082 which is not significant at p<.01. Considering all participants, this coefficient was .228 which is significant at p<01. Table 2 summarizes these results.

Table 2. The correlation coefficients between intelligence scores and vocabulary scores in different groups of participants

Participants group	Number of participants	Correlation coefficient	Significance
Grade 2	80	.384	.000
Grade 3	102	.082	.207
All participants	182	.228	.001

The results obtained about the relationship between intelligence scores and grammar scores for the three groups of participants are as follows. In grade two, the correlation coefficient was .454 which is significant at p<.01. In grade three, the correlation coefficient was .078 which is again not significant at the same level of significance. And for all participants of the study, this coefficient was .246 which is significant at p<.01. These results are presented in Table 3.

**Table 3. The correlation coefficient between intelligence scores
and grammar scores in different groups of participants**

Participants group	Number of participants	Correlation coefficient	Significance
Grade 2	80	.454	.000
Grade 3	102	.078	.219
All participants	182	.246	.001

To answer the fourth research question, a different method of data analysis was used. In each group of participants (grade 2, grade 3, and all participants), two subgroups were chosen from those participants who attended English classes outside school (Group C) and those who had never attended any English classes (Group N). These subgroups were chosen in a way that their number of participants and their mean intelligence score were exactly the same (for more details, see Section 3.4). Then the mean English score was calculated for each subgroup.

In grade two, there were 18 students in each Group C and N, and the mean intelligence score of each group was 48.39. The mean English test score of Group C was 19.28, while Group N had a mean English test score of 13.89. A T-test was run on these two means and the difference between them was significant at $p<.01$ (the significance of means are two-tailed).

In grade three, Groups C and N consisted of 27 students each and the mean intelligence score of them was 49.63. The mean English test score of Group C was 20.85, and this score for Group N was 10.55. As it seems evident, the difference between these two means are significant at $p<.01$.

All participants of the study were also considered as a whole with Groups C and N having 45 members each and the mean intelligence score of 49.13. The mean English test score of Group C was 20.22, and the mean English test score of Group N was 11.89. This difference is also significant at $p<.01$. The results of this part are summarized in Table 4.

Table 4. The results of mean analysis of subgroups in different groups of participants

Participants group	Number of participants in each subgroup	Mean intelligence score of both subgroups	Mean English test score of Group C	Mean English test score of Group N	t	Degrees of freedom	Significance
Grade 2	18	48.39	19.28	13.89	3.020	17	.008
Grade 3	27	49.63	20.85	10.55	8.280	26	.000
All participants	45	49.13	20.22	11.89	7.699	44	.000

5. Discussion and conclusion

The results of this study show that there is a weak positive relationship between intelligence and foreign language achievement in general, and learning

vocabulary and grammar in particular. Although in third-grade students there was no significant relationship between intelligence and foreign language learning, the relationship was significant, but very weak, when all participants were considered as a whole.

The reason why the relationship between intelligence and foreign language achievement was not significant in grade three but it was so in grade two can be explained as follows. The second-grade students were of two majors, namely mathematics and humanities. On the other hand, all third-grade students were of the same major, biology. At Iranian high schools, usually more intelligent students choose mathematics as their major, students with average intelligence choose biology, and less intelligent students choose humanities. These choices are sometimes made based on the students' marks at different subject matters and sometimes based on the students' interest, both of which usually reflect the students' general intelligence in its traditional definition. Therefore, in our study, second-grade students' intelligence scores as well as their English test scores were widely varied. But in the third grade, the intelligence scores of the student were very similar because the students were of the same major, while their English test scores were widely varied due to reasons other than intelligence (one of which can be the amount of practice they put into learning English). As a result, no significant relationship was found between these two variables.

Another point to mention about the relationship between intelligence and foreign language achievement is that although this relationship was found to be positive, this relationship was very weak (.45 for grade two and .25 for all participants). Therefore, we can conclude that although intelligence can affect foreign language learning positively, this effect is not very strong and many other factors may affect foreign language learning and weaken the effect of intelligence.

Considering the relationship between intelligence and learning vocabulary and grammar, the results showed that this relationship was stronger in learning grammar than in learning vocabulary, though both relationships were weak. We can conclude that more intelligent learners are at an advantage in areas which need reasoning, such as grammar, more than areas which need better memory. This is in contrast with Brown's (2000) view which attributes the success of intelligent people to their memory and states that the greatest barrier to second language learning is a matter of memory.

The last and, at the same time, the most important conclusion we can make based on the results of this study is that among the learners with equal intelligence, those who put more practice into learning a foreign language are more successful. This conclusion is based on comparing the English test performance of those participants of this study who attended English classes outside school and those who had restricted themselves to what they learned at school and had never attended any English classes. While the intelligence scores of these groups were equal, the first group outperformed the second group significantly. This finding is in line with the recent demise of language

aptitude tests in general, and intelligence tests in particular, to predict the success of language learners. The implication is that thought intelligence and aptitude are effective in language learning, there are some other factors which can compensate for the lack of these attributes.

This study has implications both for foreign language teachers and foreign language learners. When teachers face learners who seem to be slow on the uptake, they shouldn't leave them on their own. Such learners need more practice and more help. Therefore, teachers should lead these learners to practice more either inside or outside the class. Teachers should be more patient with these students and provide them with opportunities to be active inside the class. Instead of suppressing them, teachers should encourage these students to participate in class activities, even if they have a lot of errors. Teachers can also give these students more homework. Learners should also know that practice makes perfect. Sometimes saying that "I'm not talented enough to learn a foreign language" is just an excuse on the part of students to justify their lack of effort. It may take longer for less intelligent people to learn something, but it is never impossible to learn it. It is just a matter of time and effort learners put into practicing a foreign language.

6. References

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