The effectiveness of Duolingo application training on motivation and attitude towards learning and anxiety in English

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Abstract

Introduction: English has a significant place in the education system and is a compulsory subject at various levels, especially at the upper secondary level. The integration of technology, especially internet-based media, offers significant opportunities to empower students by enhancing creativity, fostering independence, expanding access to diverse learning resources, and supporting the development of their English skills. Since English has become an international language, people all over the world communicate with each other using English, therefore, English is an important language that everyone should master.The purpose of this study was to investigate the effectiveness of Duolingo application training on motivation, attitude towards learning and anxiety of English language among female students in secondary schools in Sarvestan city.

research methodology: The present research design was a semi-experimental pre-test-post-test design with a control group. The statistical population included all female students in the second grade of secondary school in Sarvestan city in the academic year 2024 -2025, from which a sample of 60 people was selected using multi-stage cluster random sampling method and according to the inclusion criteria for the study, and then they were randomly assigned to two groups of 20 people: experimental and control. Initially, all subjects in the two experimental and control groups completed the Motivation and Attitude towards English questionnaire as a pre-test.

Findings: Duolingo application training has a significant effect on students' motivation and attitude towards learning and anxiety about English. Duolingo application training has a significant effect on students' motivation and attitude towards learning English. Duolingo application training has a significant effect on students' English anxiety. (p<0.01).

Conclusion: Teaching the Duolingo application has significantly increased the attitude towards the importance of learning a foreign language, parents' motivation for their children to learn a foreign language, motivation for a tendency (desire) towards learning a foreign language, and students' attitude towards learning a foreign language, as well as reducing communication anxiety, fear of negative evaluation, and English exam anxiety among female high school students.

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Key Words: Duolingo application, motivation and attitude towards learning English, English language anxiety, students.

Introduction

English has a significant place in the education system and is a compulsory subject at various levels, especially at the upper secondary level. The integration of technology, especially internet-based media, offers significant opportunities to empower students by enhancing creativity, fostering independence, expanding access to diverse learning resources, and supporting the development of their English skills. Since English has become an international language, people all over the world communicate with each other using English, therefore, English is an important language that everyone should master (Pradhana et al., 2023). The use of the Duolingo application as a medium for learning English has attracted considerable attention in various studies due to its potential to enhance students' language skills. Duolingo is a platform designed for language learning, available both as a website and as a mobile application. Its structure consists of language "trees" that are divided into units, each of which contains several "skills". These skills are organized into six levels, each with 4 to 6 lessons (Sakalavsek and Leanavisiot, 2022). A prominent intelligent language learning platform integrates game components and adaptive learning mechanisms, making it particularly relevant for strengthening listening comprehension skills (Jiang et al., 2024). Duolingo is a technology-based educational program that offers an interactive and gamified approach to mastering the English language. It can have a positive impact on the acquisition of English language skills, including reading, writing, listening, and speaking (Fitriani and Mokodompit, 2025).

Among the antecedents of Duolingo application training are motivation and attitude towards learning and English language anxiety, which are addressed in this study. Motivation is recognized as an essential component for achieving any goal and is particularly important for success in acquiring a second or foreign language. Motivation theory and scientific research focus on understanding what drives individuals to make specific decisions, take action, and persist in their efforts (Yoshida, 2022). Motivation in second or foreign language learning has received considerable attention, evolving through various theoretical perspectives. Gardner (2010) defined motivation as "the amount of work or effort an individual puts into learning a language due to the desire to do so and the satisfaction experienced in the activity." He emphasized that understanding learners' ultimate goal or underlying reason for learning a language, called learner orientation, is key to understanding the source of their motivation (Saleh and Parapathik, 2025).

 Gardner (2010) further distinguished between two types of language learning motivation: integrative and instrumental. Integrative motivation refers to the learner's desire to assimilate into the target language society and culture, which is crucial for achieving proficiency. In contrast, instrumental motivation involves practical needs, such as career advancement, passing an exam, or improving social status. For example, in bilingual Montreal, integrated motivation is more strongly associated with French language proficiency (Saleh & Parapatik, 2025). According to Gardner (2010), a central factor influencing language acquisition is the learner's attitude toward the language they are trying

to acquire. When an individual has a favorable view of the target language and its associated culture, they are more likely to be a member of that linguistic and cultural community. This positive perception subsequently encourages them to achieve their language learning goals. Language attitudes are "individuals' attitudes toward languages that reflect broader social and cultural values" (Saleh and Parapathik, 2023). Foreign language anxiety is a specific type of anxiety that psychologists describe as specific anxiety and is considered an important emotional variable in the language learning process of language learners, as anxiety can disrupt their learning process. Anxiety has detrimental effects on students' performance, emotional reactions, general attitude, self-confidence, and level of participation, and for this reason, most of them use avoidance strategies such as absenteeism from class (Zhang et al., 2023). Ortega (2009) describes foreign language anxiety as an intense feeling of tension, apprehension, and fear even when thinking about a foreign language. Some people experience this anxiety to a greater extent and may feel anxious in a variety of situations. However, foreign language anxiety is a specific condition and can affect people who are not particularly anxious in other situations, making them The language classroom situation can cause anxiety (Khodabakhsh, 2025). In this regard, there have been various domestic and foreign research studies, which briefly mention a few:

Ehsanpour and Khodashenas Limoni (2023) conducted a study titled "Investigating the Effect of Educational Software on English Language Learning of Second Grade Female High School Students in Ghaemshahr City." The findings of the study showed that educational software was able to affect three areas of learning, namely the cognitive area, the psychomotor area, and the emotional area. The results indicated that the method of using educational software has a greater effect on learning than the traditional method. Sharifi Asadi (2019) conducted a study titled "Investigating the Effect of Auto-Correction Educational Software on English Language Learning: A Case Study (Second Grade Female Students in High School in Ghaemshahr City). The findings of the study showed that the auto-correction educational software was able to affect three learning domains, namely the cognitive domain, the psychomotor domain, and the emotional domain. The results indicated that the software-based method had a greater effect on learning than the traditional method.

Nasri et al. (2019) conducted a study titled "Investigating the Motivation for Learning English of Iranian Intermediate EFL Learners and Their Attitudes in a Computer-Assisted Language Learning Environment." The results of the motivation questionnaire showed that attitude-based training in a computer-assisted language learning environment progressively improved the motivation of Iranian EFL learners. In addition, the results of the 20-question attitude questionnaire showed that students have a positive attitude toward using attitude-based training in a computer-assisted language learning environment. Fakhrorian et al. (2024) conducted a study titled "Perceptions of Using the Duolingo Application" In English language learning for students to master vocabulary. The findings show that 70% of the respondents chose the option

"Agree" for item number 1. This indicates that using the Duolingo program to learn English has a positive effect on students' vocabulary skills. In addition, the overall results of the 10-question questionnaire indicate general agreement among the participants. The Duolingo program may be seen as a valuable tool for acquiring vocabulary. The Duolingo program is a valuable tool for acquiring English language skills because it not only facilitates learning, but also increases student engagement by providing an enjoyable and non-monotonous learning experience. Empirical evidence shows that Duolingo is a skilled tool for acquiring language skills. The use of the Duolingo program has shown to be a successful method for increasing students' vocabulary skills. Indrawan et al. (2023) conducted a study titled The Effect of Using Duolingo on Students' Motivation in English Language Classrooms. The results show that most students have positive feelings towards using Duolingo, as indicated by the predominant prevalence of "agree" and "strongly agree" responses. However, in terms of competitiveness, Duolingo may not be so compelling that students are inclined to compete and score better than their peers. In general, students are aware of the motivational value that Duolingo potentially offers.

Yandayani et al. (2023) conducted a study titled Duolingo-based English language skills assessment: Through the perspective of professional students. The findings showed that students experienced several positive effects when using Duolingo as an English language skills assessment tool, including its engaging nature, facilitating the assessment of independent language skills, creating positive motivation, and improving vocabulary mastery. However, participants also pointed out drawbacks such as Duolingo's inability to provide specialized vocabulary in electromedical engineering, the use of fake images that hinder understanding the meaning in real-life contexts, and the lack of interaction in assessing language skills. Fitria et al. (2023) conducted a study titled Duolingo App for Improving English Conversation Skills. The results of the study show that 90% of students claim that learning through Duolingo app helps them improve their English conversation skills. Furthermore, the most improved aspect of speaking skills is vocabulary, followed by other aspects such as pronunciation, grammar, and fluency. In this study, students responded positively. Hence, Duolingo app effectively improves students' speaking skills.

Understanding the relationship between students' attitudes and their motivation to learn English is crucial for educators and policymakers. Recent studies suggest that these attitudes are increasingly shaped by socio-economic considerations, policy changes, and regional dynamics. Prioritizing English for Academic and Professional Purposes By addressing these emerging trends, this research provides valuable insights into how language attitudes towards English are being reshaped in the country, thereby providing strategies for more effective language education policies and classroom practices. The present study seeks to explore this gap in students by using the Duolingo app, which plays a crucial role in developing and nurturing motivation and attitudes towards learning and anxiety in English. In addition to the reasons mentioned, it should be added that most studies related to Duolingo application training are

scattered and general or during other research. As far as the researcher has investigated, no comprehensive and extensive research has been conducted to examine the effect of this educational software on motivation and attitude towards learning and anxiety of upper secondary school students simultaneously and in the form of an interventional study. Given the importance of the subject, a research gap and poverty is felt in this field. Therefore, the purpose of the present study is to examine the effectiveness of Duolingo application training on motivation and attitude towards learning and anxiety of upper secondary school female students.

Research question

Does teaching the Duolingo application have a significant effect on students' motivation and attitude towards learning and anxiety about English?

Methodology

The present research design is a quasi-experimental pretest-posttest type with a control group. The statistical population includes all female high school students in Sarvestan city in the academic year 1402-1403, from which a sample of 60 people was selected using multi-stage cluster random sampling method and according to the inclusion criteria for the study, and then randomly assigned to two groups of 20 people (control experimental group (30 people) and control group (30 people). The selection criteria for participants in the study included obtaining a score lower than the average in the research questionnaires, the subject's failure to participate in other educational or therapeutic interventions at the same time, and the subject and their parents' consent to participate in the study. The exclusion criteria also included absenteeism of more than 2 sessions in educational sessions, failure to complete the questionnaires in the pre-test-post-test stages, and lack of desire to continue participating in the research process. The ethical considerations considered in this study included obtaining informed consent from the school parents and students based on Participate in this research and fully explain the process and goals of the training sessions, ensure that the data obtained are confidential, and that the intervention program used has no harmful effects on the students.

1- Motivation and Attitude Questionnaire towards Learning English: This questionnaire was developed by Gardner and Lambert (1959) with 37 questions and four components: the importance of learning English (1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 33, 35, 37), parental motivation for their children to learn English (2, 5, 8, 20, 23, 32, 36), the motivation of the tendency (desire) towards learning a foreign language (3, 6, 9, 21, 24, 34), and the attitude towards the origin of the desired language (11, 14, 17, 26, 29), and the Likert scale scoring method with five options. In the study of Ghorban Dordinejad (2014), the method of construct validity (confirmatory factor analysis) and reliability (calculation of Cronbach's alpha coefficient) was used. The reliability of this questionnaire was obtained by calculating Cronbach's alpha of 0.937. In the results of the calculation of confirmatory factor analysis, four factors were identified that measure the attitude about the importance of language, the attitude of parents towards children's language learning, the attitude towards native speakers and the motivation towards language learning. Considering the

results of this study, it can be said that this questionnaire has appropriate reliability and validity and the obtained factors provide an appropriate conceptual model about the attitude and motivation to learn English among Iranian learners.

2- Foreign Language Classroom Anxiety Questionnaire: This questionnaire is an extension of the Foreign Language Classroom Anxiety Scale of Horwitz et al. (1986) and includes 33 questions and three components: communication anxiety (1 to 11), fear of negative evaluation (12 to 18), and language test anxiety (15 to 33) with a five-point Likert scale scoring method. The test-retest coefficient of the initial version of this test on students at the University of Texas was calculated to be 0.93, and after an 8-week period it was 0.83. In the study by Horwitz et al., the construct validity of the questionnaire was confirmed by factor analysis and content validity by examining the importance and necessity indices with the opinions of a group of experts, and the correlation between the subscales was more than 0.60. Reliability using Cronbach's alpha was 0.77 for communication anxiety, 0.80 for fear of negative language evaluation, 0.79 for language test anxiety, and the total score was 0.84. In Iran, Homayuni and colleagues confirmed the construct validity of the questionnaire using factor analysis on bilingual Turkmen students, and the reliability using Cronbach's alpha was 0.80 for fear of negative evaluation, 0.77 for test anxiety, and 0.71 for communication anxiety. In order to analyze the data, analysis of covariance was performed using SPSS 25 software.

Research Findings

The descriptive findings of the present study include the mean and standard deviation of the sample members' scores for all variables studied in this study. The mean and standard deviation of the scores of the research variables in the experimental group and the control group (control) in the pre-test and post-test stages are listed in Table 1.

Table 1. Descriptive findings of motivation and attitude towards learning English in the pre-test and post-test stages

Group				Statistics	Variable
Control group		Experimental group			
Post-test	Pre-test	Post-test	Pre-test		
3/49	2/83	3/16	3/10	Average	Attitude towards the importance of learning a foreign language
0/496	0/348	0/539	0/531	Standard Deviation	
3/18	2/45	2/82	3/12	Average	Parents' motivation for their children to learn a foreign language
0/590	0/350	0/650	0/412	Standard Deviation	
3/22	2/67	2/95	3/20	Average	Motivation: tendency (desire) towards learning a foreign language
0/545	0/460	٠/٥٧٢	0/703	Standard Deviation	
3/35	2/79	3/07	2/91	Average	

			0/489	0/391	0/522	0/570	Standard Deviation	Attitude towards the origin of the language in question

Table 2. Descriptive findings of research variables in the pre-test and post-test stages

Group				Statistics	Variable
Control group		Experimental group			
Post-test	Pre-test	Post-test	Pre-test		
3/35	3/10	3/45	3/34	Average	Communication anxiety
0/296	0/531	0/295	0/302	Standard Deviation	
3/88	3/12	4/00	3/76	Average	Fear of negative evaluation
0/540	0/412	0/499	0/561	Standard Deviation	
3/22	2/91	3/29	3/14	Average	Language test anxiety
0/379	0/570	0/379	0/359	Standard Deviation	

The results of the descriptive table (Tables 1 and 2) show that the average of the variables of attitude towards the importance of learning a foreign language, parental motivation for children to learn a foreign language, motivation (desire) towards learning a foreign language and attitude towards learning a foreign language, communication anxiety, negative evaluation, language test anxiety of students in the experimental group increased in the post-test stage compared to the pre-test stage, and the significance of this change was further examined by multivariate analysis of covariance. Before presenting the results of the multivariate analysis of covariance, the underlying assumptions of this analysis (assumptive normality, homogeneity of regression slopes, homogeneity of variances) were examined. Accordingly, the results of the Kolmogorov-Smirnov test indicated that the assumption of normality of the sample data in the variables of attitude towards the importance of foreign language learning, parental motivation for children's foreign language learning, motivation for tendency (desire) towards foreign language learning and attitude towards foreign language learning, communication anxiety, fear of negative evaluation and language test anxiety in the experimental and control groups was valid in the pre-test and post-test stages ($p<0.05$). The results of the test to examine the homogeneity of the regression slope of the pre-test and post-test of the total score of attitude towards the importance of foreign language learning, parental motivation for children's foreign language learning, motivation for tendency (desire) towards foreign language learning and attitude towards foreign language learning, communication anxiety, negative evaluation, language test anxiety in the experimental and control groups showed that the regression slope was valid for the total score of the variables. Levine's test was used to examine the homogeneity of variances. Based on this test, the homogeneity of variances

was valid in the groups (p<0.05). By establishing the assumptions of the analysis of covariance, it is safe to use this test. The results of the multivariate analysis of covariance for comparing means are presented in Table 3.

Research hypothesis: Teaching Duolingo application has a significant effect on students' motivation and attitude towards learning and English language anxiety.

Table 3. Summary of the results of multivariate analysis of covariance for comparing the mean post-test scores of the dependent variables of the experimental and control groups

Significance level	Degrees of freedom Error	Degrees of freedom	F	Value	Test	Effect
0/001	58	1	19/955	0/412	Pillai	Group
0/001	58	1	19/955	0/588	Wilks's Lambda	
0/001	58	1	19/955	0/700	Hotelling	
0/001	58	1	19/955	0/700	Roy's Largest Root	

As the results in Table 3 show, there is a significant difference between the experimental and control groups in terms of motivation and attitude towards learning and anxiety in English in the post-test phase (p < 0.005). In order to investigate the point of this difference, a univariate analysis of covariance in the Mancova text was performed on the dimensions of motivation and attitude towards learning and anxiety in English, the results of which are presented in Tables 4 and 5, respectively.

Table 4. Results of univariate analysis of covariance to examine the post-test differences in dependent variables in the experimental and control groups

P	F	MS	Df	SS	Source of indicators
0/001	22/318	11/587	1	11/587	Attitude towards the importance of learning a foreign language
0/001	16/789	13/180	1	13/180	Parents' motivation for their children to learn a foreign language
0/001	8/382	8/452	1	8/452	Motivation: tendency (desire) towards learning a foreign language
0/001	8/352	7/011	1	7/011	Attitude towards the origin of the language in question

As the results in Table 4 show, there is a significant difference between the experimental group and the control group in terms of research variables, and Duolingo application training had a significant effect on the research variables, in that this training significantly increased the attitude towards the importance of learning a foreign language, the motivation of parents for their children to learn a foreign language, the motivation of the tendency (desire) towards learning a foreign language, and the attitude towards learning a foreign language among female high school students.

Table 5. Results of univariate analysis of covariance to examine the difference in post-test English language anxiety in the experimental and control groups

P	F	MS	Df	SS	Source of indicators
0/001	32/096	2/853	1	2/853	Communication anxiety
0/001	22/163	6/718	1	6/718	Fear of negative evaluation
0/001	12/249	1/742	1	1/742	Language test anxiety

As the results in Table 5 show, there is a significant difference between the experimental group and the control group in terms of research variables, and Duolingo application training had a significant effect on the research variables, in that this training significantly reduced communication anxiety, fear of negative evaluation, and English exam anxiety among female high school students.

Discussion and conclusion

The present study aimed to investigate the effectiveness of Duolingo application training on motivation and attitude towards learning and anxiety of English language in female high school students in Sarvestan city. As the results showed, Duolingo application training has a significant effect on motivation and attitude towards learning and anxiety of female high school students. The results of this finding are consistent with the results of studies conducted by Ehsanpour and Khodashenas Limoni (2023), Sharifi Asadi (2020), Nasri et al. (2020), Fakhruriyana et al. (2024), Indravan et al. (2023), Yandayani et al. (2023), Fitria et al. (2023). In explaining the findings of the study, it should be said that the popularity of mobile technology in language learning is increasing due to the widespread development of language learning applications (apps) for mobile devices. These applications are designed in an attractive way by considering the important principles of language learning. English learning apps are among the most sought-after. These new mobile technology products are trusted by a large number of foreign language learners to increase their knowledge of the target language, and many of them rely solely on the apps as their source. Being free and equipped with interesting features, these English learning apps can be an essential support for students to independently learn English outside the classroom at minimal cost. Integrating mobile technology into language learning can facilitate teachers to have authentic teaching materials and guide students to interact with other language learners.

Such interaction is very important for students because they can have real experiences in practicing the language. The great capabilities of mobile technology not only allow for integrated learning that bridges classroom and outside the classroom, but also provide the opportunity to create innovative teaching methods. This software offers comprehensive English teaching that covers all the macro skills of reading, listening, speaking, vocabulary and

grammar through games and interesting scenarios. Users are given a customized lesson based on the learning goals they specify when setting up their account. Each lesson is presented in a specific module containing English conversation with audio explanations, vocabulary, and grammar. Each module is followed by a game exercise that tests users on the topic they have just learned. Intelligently designed and taking into account the capacities of IQ and emotional intelligence, individual differences, Duolingo's teaching application is able to motivate and learn students in learning English and reduce anxiety in the classroom and related tests. It provides an opportunity for students to develop their academic skills including vocabulary, conversations, grammar rules, which leads to increased self-efficacy, motivation and enthusiasm, insight and a positive attitude towards learning English, and prevents anxiety and tension in the classroom and procrastination.

In addition, the results showed that Duolingo application training has a significant effect on the dimensions of motivation and attitude towards learning English in female students of the second secondary school of Sarvestan city, and this intervention program has improved and developed students' motivation and attitude towards learning English. The results of this finding are consistent with the results of research conducted by Tajik (2025), Yuan and Liu (2025). In explaining this finding, it can be said that improving foreign language skills As your vocabulary increases, your foreign language skills improve, and as students progress in their skills, their learning intensity increases. Students are required to master the efficient and wise use of technology in daily activities. Teachers should also adopt innovative learning methods.

Duolingo application training develops English learning in students. The benefits and positive feedback that the Duolingo application has generated among users, especially students, have led to a positive attitude and enthusiasm among students and parents towards learning and teaching English. Given that English is one of the basic and main subjects in schools and that learning it is of great importance, and this is not only due to the fact that it is a subject and a prerequisite and necessary for academic progress. But also due to the expansion and globalization of technology and students' access to this technology in order to communicate with others and acquire various skills, learning English is very necessary and important, and the role of schools and families cannot be ignored.

In addition, according to the results obtained, the application program training has a significant effect on the dimensions of English language anxiety in female high school students in Sarvestan city, and this training reduces English language anxiety in these students. The results of this finding are consistent with the results of research conducted by.

Language anxiety, especially in the field of English learning, is a very serious problem that students continue to face and affects language learning. Language anxiety refers to the fear or apprehension that learners have to engage in language-related tasks, such as speaking or writing in a language that is not their native language. This anxiety can manifest in various ways, including the fear of making mistakes, feeling judged, or being negatively evaluated by peers or instructors. Anxiety has been considered as a major factor that causes learners

to avoid or reduce communication, which in turn hinders their learning outcomes. Anxiety in learning and the classroom has a wide range of dimensions, including communication anxiety, test anxiety, and fear of negative evaluation. One of the strategies suggested to reduce anxiety in learning English is to use the Duolingo application, which fortunately has positive effects in reducing and eliminating anxiety in learning English. In addition to jeopardizing the physical and mental health of students, anxiety in learning can reduce interest, attitude, and motivation in learning English and school, which leads to procrastination, dropout, academic failure, pessimism and despair, depression, and anxiety, and destroys the future of students. Therefore, it is necessary for families and the education system to take measures to reduce anxiety in learning English.

Among the limitations of this study are the limitations of the level of education and gender, which should be considered when generalizing its results to male students and other levels of education. For this reason, it is suggested that future research on the same topic be conducted on male students as well as students with different levels of education and cultures. Obviously, efforts to overcome the aforementioned limitations will give the research more credibility. Regarding practical suggestions, given the significant effect of Duolingo application training on the research variables, this intervention can be used by educational and educational counselors in the form of an educational program to increase the attitude towards the importance of learning a foreign language, the motivation of parents to learn a foreign language for their children, the motivation of the tendency (desire) towards learning a foreign language and the attitude towards learning a foreign language, as well as reducing communication anxiety, fear of negative evaluation, and language test anxiety in students.

It is also recommended that the Education Organization conduct training courses and workshops to increase the awareness of educational counselors and school psychologists about the positive effects of this educational intervention on the attitude of the importance of learning a foreign language, parents' motivation for children to learn a foreign language, motivation of the tendency (desire) towards learning a foreign language and attitude towards learning a foreign language, as well as reducing communication anxiety, fear of negative evaluation and anxiety about English language exams among students, as well as the method of implementing training sessions and strategies for using this educational intervention. In conclusion, it should be said that the results of this study can be useful for students, teachers, families, students and professors who are involved in learning English.

Conclusion

Finally, according to the findings of the present study, it can be concluded that Duolingo application training is effective in increasing motivation and attitude towards learning and reducing English language anxiety of students.

Following the principles of research ethics

Informed consent forms were completed by all subjects in the present study.

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Conflicts of interest

According to the authors, the present article does not have any conflict of interest.

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