

## The Impact of Age and Gender on Attitudes and Motivation in Adult Iranian EFL Learners in AR-Integrated Learning

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**Abstract.** The present study investigated the relationship between age and gender with EFL learners' attitudes and motivation while using Augmented Reality (AR) technology in learning. The goal was to see if age and gender impacted language learning motivation in adult Iranian EFL learners in AR-enhanced language learning. To this end, a

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quasi-experimental pre-test and post-test study was designed and implemented. Participants were 40 adult pre-intermediate EFL learners in a language institute in Iran. They were randomly assigned to the control (n=20) and experimental (n=20) groups. Both groups went over a 20-session course with the experimental group using AR-infused learning materials while the control group used the conventional ones. Data was gathered through Gardner's (2004) Attitude/Motivation Test Battery (AMTB) in the form of questionnaires and analyzed through ANCOVA via SPSS. Results revealed that while gender did not affect language learning motivation, there was a significant difference between motivation levels in different aged learners. Findings of this study call for more research in this domain and are beneficial to policy-makers and instructors in the field of language education.

**Keywords:** Augmented reality, CALL, educational technology, language learning motivation

## 1. Introduction

Various technologies have been incorporated into the teaching and learning of English during the past years. One recent technology is Augmented Reality which bridges the real and virtual worlds. Augmented Reality is a valuable instructional tool because it integrates digital objects and the real educational environment (Liu et al., 2010). It can embed digital media content into the real world via a specific device's screen like a tablet or a mobile phone.

Researchers and instructors examined the effect of this technology in different areas of education. For instance, Lee (2012) specified that Augmented Reality could make the learning settings more dynamic, enjoyable, and collaborative than before. Moreover, AR provides a richer learning experience for learners, which results in improved educational outcomes (Liu et al., 2010). Researchers also added that this technology adds enjoyment and fun to the learning environment, thus enhancing learner motivation (Lazoudis et al. 2013). As such, enhancing motivation is one of the most significant capacities that AR brings to the classroom.

Besides, AR is beneficial to the teaching and learning process in several ways. One of the major benefits of this technology for education is

stimulating various sensory modalities such as sight, touch, and hearing. Consequently, AR technology enables learners to engage actively in the process of learning (Prez-Lpez & Contero, 2013). Mahadzir and Phung (2013) found out that when learners are faced with the audio-visual learning content provided with the AR technology, they get motivated and learn better, especially young primary school students.

In language education, researchers have studied the application of AR in teaching and learning various language skills and components. For instance, Lee et al. (2019) and Pu and Zhong (2018) studied how AR can improve the experience of teaching and learning kindergarten and pre-school English vocabulary. Chew et al. (2018) designed an AR application to help learners learn English idioms. Bursali and Yilmaz (2019) found AR applications effective instructional aids in learning and teaching reading comprehension. Finally, Rehring et al. (2019) found that AR technology brings about the possibility of carrying out digital immersive language learning successfully.

In brief, Augmented Reality, as one of the most recent types of educational technology, has provided various educational domains with capacities that can enhance learning and teaching. Relevant to the purpose of this study, it boosts learners' attitudes and motivation in language learning. Below, a detailed introduction of this technology is presented followed by an explanation of how it is related to motivation in language teaching and learning.

## 2. Literature Review

### 2.1 Augmented reality

Nowadays, technology has changed the learning and teaching process that takes place in the classroom. It causes rapid changes and developments in the educational setting by introducing and integrating technology tools into education. Although Augmented Reality has been around for about 50 years, its rapid development has expanded at higher rates recently.

To “augment something” denotes the increase in the amount of something, its value, size, and so on, of something (Oxford Advanced Learner's Dictionary, 2015). To “augment reality” is to “strengthen”

or “extend” reality itself. Thus, Augmented Reality has been utilized to portray the innovation behind developing or strengthening the real world. Augmented Reality is defined as “a modern computer-assisted learning environment that combines the observed real-world phenomena with graphically added information or images, even spatially positioned sounds can be used” (Salmi et al., 2012, p. 285). It can be considered as a variety of Virtual Reality (VR). VR submerges users in an artificial setting where they cannot see the reality around them. Conversely, AR permits the user to see the reality, with virtual objects superimposed upon or composited with this reality. AR complements reality rather than completely supplanting it (Azuma, 1997).

Nevertheless, Augmented Reality innovation is now inserted into cell phones and tablets to give intelligent encounters to the client (Lee, 2012). This innovation empowers print materials to be more intelligent for students to support, connect with, and inspire. Increased Reality applications can incorporate text like books, papers, manuals, magazines, papers, flyers, and banners; AR can improve Adobe Portable Document Format (PDF) reports and advanced photographs. The primary thought is to transform the text into more intelligent material by mixing physical and digital worlds.

Augmented Reality applications offer much more than images, audio, or videos overlaid in the real world. They propose various helpful applications. One application is that it creates novel potentials for education acknowledged by various educational researchers (Wu et al., 2013). Augmented Reality technology is an increasingly developing tool. It is evident from research that it proved to be successful and popular in any domain it served. Kipper and Rampolla (2013, p. 14) mentioned that “it continues to develop over the decades and works its way into the modern technological landscape of today”. AR technology can be used in various areas. Examples include advertising, navigation, tourism, sight-seeing, education, entertainment and games, and medicine. “Augmented Reality has been put to use by several major companies for visualization, training, and other purposes” (Lee, 2012, p. 403).

AR has affected the education sector dramatically. According to (Lee, 2012, p. 403), it “is one technology that dramatically shifts the

location and timing of learning”. AR enables learners to interact with the world. Images and physical objects can come to life with the power of interactive digital audio, video, and 3D items. It is believed that Augmented Reality can help students learn better as it generates novel, thought-provoking opportunities (Koutromanos et al., 2015). AR applications offer limitless opportunities to the learning environment. Most learners today are used to using technology very easily. Therefore, integrating these technologies into the instruction can engage learners in the teaching and learning process. As one type of such technology, Augmented Reality can create challenging, engaging, and interactive opportunities for teaching and learning.

When AR is applied in the classroom, it takes the teaching and learning process to a new and different level. As Bower et al. (2014) claimed, learners praised how they could do the AR activities and enjoyed them, which should not be possible without using AR. This has fostered motivation in students, as proved in several studies. For instance, Lee (2012) considered Augmented Reality a motivating instructional tool that can enhance learners’ reality-based exercises.

It is essential to apply the best and latest strategies and tools in the classroom to support learning and engage the students to maximize teaching and learning capacities. According to Balkun (2011, p. 15), when using technological advancement in the classroom, “the goal is to provide an enriched experience that gave students access to information and materials not readily available elsewhere”. Using audio and video was introduced into teaching a long time ago. Augmented Reality moves this further by adding different multimedia formats and allowing interaction with them.

Rather than being a replacement, AR materials can be a complement to a conventional curriculum. When implementing AR features into the traditional materials, the goal is to provide the learners with some supplementary information in a more recent, multimedia format. Also, one other significant capacity that AR offers education is that it allows the teacher and the learner who are not in the same physical location to share the same virtual content at the same time, thus, promoting collaborative learning. They can share the same content and materials and

interact with them and each other simultaneously.

In sum, the application of Augmented Reality as new technology has been of interest recently in many terrains, including education. It brings about opportunities to various unique, attractive, and collaborative fields. The possibilities created by AR cannot be experienced in any other way, hence the unique value of this technology. Research has also supported its use and proved beneficial in different fields, including education.

## **2.2 Attitudes and motivation toward language learning**

Motivation is one of the most significant studies in human performance. It plays a crucial role in human activities. Focusing on L2 learning and bilingualism, Gardner (1985) highlights the significance of attitudes since language learning is a significantly different learning process from any other subject of education. As Gardner asserts, in language learning, learners are required to make the language an integral part of their behavioral capacity. Most aspects of a language are parts of another culture that a learner needs to intake and ingest. Based on the above, attitude and motivation are integral in language teaching and learning. These two interconnected concepts are seen as one by some scholars such as Gardner and can be considered a single construct in further studies in language education. To see how these constructs can be evaluated, studies on measuring attitude and motivation are discussed in the next section.

According to the literature, surveys have been the most used tool in measuring attitude and motivation. As stated by Creswell (2014, p. 155), “a survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population”. Therefore, we chose the survey as the measurement tool for this study. They selected the scale developed by Gardner (1985), who was among the pioneers in attitude and motivation study, introduced briefly below.

Gardner’s (1985) measurement tool, called The Attitude/Motivation Test Battery, was developed following more than 20 years of research in the field. It was first devised to investigate the attitude and motivation of

English-speaking learners of the French language. Later, Gardner (2004) provided an English translation of the same test, which consists of 104 items. Since the employment of the tool might not be feasible in specific research settings, Dordi-nezhad (2015) developed a shorter version of the tool with 37 items, which is used in this study.

### **2.3 Empirical studies**

This section presents an overview of the earlier research on the relevant areas under study in this investigation. Studies that deal with motivation in AR-integrated language learning are presented, followed by studies on the impact of age and gender on motivation in language learning.

Norouzifard et al. (2021) in their study investigated the impact of AR-infused language teaching on adult EFL learners' attitudes and motivation in a mixed methods study. They collected data through questionnaires and interviews with learners and found that learners who experienced AR in language learning had higher levels of motivation compared to those who did not.

Redondo et al. (2020) evaluated the application of AR in early childhood education. The purpose was to examine if using AR helps improve English language learning, enhance motivation, and promote socio-affective relations in early childhood students. The study adopted a quasi-experimental design with 102 students of 3-5 years of age in Spain. Results showed substantial progress in learners' motivation and socio-affective relationships in those learners who experienced language learning using Augmented Reality.

Besides, Taskiran (2019), in her study, assessed university language learners' experience of using AR-enhanced learning materials in learning the English language with a game-based approach. Participants of the study were 83 first-year students at Anadolu University School of Foreign Languages (AUSFL), Turkey. Data was gathered through the Intrinsic Motivation Inventory (IMI) survey. The procedure involved four different games introduced to the four different classes to the participants were distributed. The games were all AR-integrated and made by the Aurasma application. Results revealed that most learners accepted the AR learning experience and rated it as highly motivating and enjoyable.

Vedadi et al. (2019) assessed the effectiveness of an AR-integrated language learning environment, called AR English Vocabulary Acquisition (ARenVA), in vocabulary learning in primary school students. The study was done with 37 fourth-, fifth-, and sixth-grade students in Malaysia. Data were collected through interviews, observation, questionnaires, and an English test to investigate learners' perceived motivation and English language performance in a triangulation design. Results revealed that the AR experience promoted perceived motivation in primary school students. Also, it was found that students performed better in the English language following the AR learning experience.

Solak & Cakir (2015) conducted a study with 130 undergraduate students at a university in Turkey. The aim was to explore the motivation level of students towards AR-infused course materials and to examine the correlation between motivation level and academic achievement. The AR materials were designed to teach English vocabulary, including animation and pronunciation, to beginners. Data was collected through Material Motivational Survey, translated into the participants' mother tongue, i.e., Turkish. Results showed that AR-enhanced materials increased the motivation of students toward vocabulary learning. Also, a significant positive correlation was found between motivation and academic achievement in the vocabulary learning classroom.

In addition, Li et al. (2014) researched the effectiveness of an AR app on English vocabulary learning motivation using Aurasma. They adopted a qualitative approach in which data was gathered through a semi-structured interview and open-ended questions. Participants were a group of Chinese graduate students. Results indicated that AR improved learner motivation in vocabulary learning in graduate students.

Also, Mahadzir and Phung (2013) developed an AR pop-up book with ZooBurst to explore its efficacy in learning English grammar among primary schoolers in Malaysia. Data were gathered through semi-structured interviews and observation checklists. Results indicated that by using AR technology which results in enhanced motivation, the classroom gets more inspiring and more immersive, hence improving performance on the side of the students.

The studies reported above all conclude that AR is a helpful technol-



ogy in education in general and also in language learning. Besides, they confirm that one of the most significant affordances of employing AR in education is the motivation capacity it brings to the classroom. According to research, different types of learners benefitted from AR in experiencing higher levels of motivation. But in fact, some factors impact the way learners experience changes in motivation in language learning. one category of these factors is individual factors of age and gender. Below are studies that report on the impact of these factors on motivation in language learning.

In their study, Arslan and ifti (2021) examined the motivation of language learners in 6th grade. They collected the data through questionnaires from 170 students in two public and two private secondary schools in Turkey. Findings revealed that students' genders had no impact on their motivation in language learning.

Gleoğlu and Öztürk (2021) in their review study concluded that there have been contradictory results about the impact of age and gender on language learning motivation in the Turkish context. They investigated 23 research studies over 10 years and found out that age affected motivation in EFL learners in grades 5th to 8th and also in university students. On the other hand, a few other studies with participants at different age levels showed no significant relationship between age and learning motivation. Also, the study results revealed that seven out of 23 studies showed that gender impacted learner motivation in favor of females, two in favor of males, and five showed no significant difference between genders in learning motivation.

Altiner (2018) attempted to examine the relationship between learners' genders and motivation in learning English in 105 EFL learners in Turkey. They collected the data through questionnaires and found that there was no significant difference between male and female learners with regard to their language learning motivation.

Becirovic (2017) studied the relationship between age, gender, and motivation in 185 EFL learners of fifth, ninth, and twelfth grades. Results of their study showed that female students were more motivated than male students. Also, they realized that lower-aged students showed to have the highest levels of motivation while the oldest ones showed to

have the least levels.

Okuniewski (2014) studied language learning motivations in Polish learners of German. Data was collected through questionnaires from 247 students, 126 of whom were studying in secondary school and 121 at university. The study results showed that older and female students presented higher levels of motivation compared to younger and male students. ztrk and Grbz (2013) investigated the impact of gender on foreign language speaking anxiety and motivation. To this end, they collected data through questionnaires from 225 female and 158 male pre-intermediate level EFL learners. They also interviewed 19 students randomly to get more insights into the nature of the variables under study. Results revealed that female learners showed higher levels of motivation than male students.

Ruyffelaert and Hadermann (2012) investigated the impact of gender and age on learners' motivation toward learning French in a secondary school through a survey. Their study results revealed that first, young learners seemed more motivated than older ones. Also, they found boys less motivated than girls in general.

Finally, Javid et al. (2012) examined the impact of gender on learner motivation in the EFL context. They ran a survey among 709 male and female undergraduate students across three disciplines, i.e. English, medicine, and information technology in Saudi Arabia. Results revealed that English-major male students had higher motivation levels compared to females. On the other hand, the results were contrary to this regarding learners in other majors.

According to the above studies, age and gender were found to have mixed effects on language learning motivation in learners depending on the setting, discipline, and other factors. Some studies found gender to affect language learning motivations while some did not. Also, those who found out that gender impacts learning motivation are mostly in favor of girls, but the contrary was also true in some studies. Regarding age, again there have been contrary results in the relevant literature, however, most studies showed that younger learners were more motivated in language learning than older ones.

These contrary results call for more research in the area by consider-

ing a variety of learner segments and settings. That is why the current study seeks to fill in this gap partially by investigating if age and gender impact language learning motivation in AR-integrated learning which proved to be a motivating technology in education. Nevertheless, to the best of our knowledge, no study has examined the effect of using AR on adult Iranian EFL learners' motivation in relation to their age and gender. Thus, this study aims to fill in this gap in the literature. The study seeks to answer the following research question:

- Does AR affect attitude and motivation in Iranian EFL learners of different genders and ages differently?

Results of this study are useful for language learners who would integrate some self-study into their language learning. Also, language institutes and other educational organizations can employ findings that provide some language teaching in their system. Moreover, language teachers and materials developers can use the results of this study to enhance their role in their profession.

### 3. Method

The present study was carried out to examine the impact of age and gender on language learning motivation in AR-integrated learning in adult Iranian EFL learners. To this end, a quantitative quasi-experimental pre-test post-test study was designed. Details on participants, materials and tools, data collection, and data analysis employed in the study are presented below.

#### 3.1 Participants

Participants of this investigation were 40 male and female adult beginner-level EFL learners enrolled in a general English course at a language institute in Shiraz, Iran. The sample was selected based on intact sampling, consisting of two classes of 20 learners each. The classes comprised students who had already passed the previous level of EFL education in the same institute. The institute's administration assigned students to each class, and we had no interference in this. The reason for choosing this number of students was to eliminate the instructor effect. We needed both classes to be taught by the same teacher. So, based on the

administrative limitations of the institute, this could only be done in two classes. After the students were assigned to the two classes, we randomly selected one class as the control and the other as the experimental group to participate in the study.

### **3.2 Materials and instruments**

Materials and instruments used for data collection in this study involved the instructional materials, AR tools, and the Attitude/Motivation questionnaire, which are elaborated on individually below.

#### **3.2.1 Instructional materials**

The instructional materials used in this investigation were Interchange 1, the 5th edition coursebook, and complementary components. The conventional paper version of the book was used for the control group. Students had to cover units 9-16 of the book during the 20-session course defined by the institute. Also, an AR-integrated version of the same book, which was developed for the specific purpose of this study, was used by the control group.

#### **3.2.2 AR Tools**

Zappar is the name of the Augmented Reality application used in this study. It is a marker-based app that employs complex computer algorithms to bring to life the picture it scans through the camera. This app can analyze at least 30 images at a second, thus providing a rich 3D experience to the user. (<https://www.zappar.com>)

Zappar can be a delivery channel through which one can turn anything like printed materials or physical object products into interactive content, creating exciting videos, animation, games, and so on. This AR app, like others, adds a new visual dimension to what is typically seen through a mobile device's camera, making novel and engaging real-world experiences.

The app has been used for many different purposes such as retail, packaging, events, and education. It can bring to life whatever was previously regarded as 2D and add an engaging collaborative and interactive dimension. It provides a creative and exciting platform to benefit from the potential of both the real and the virtual worlds and present ideas and information more accessible and comprehensible to the users.

### 3.2.3 Attitude/Motivation Questionnaire

Gardner's (2004) Attitude/Motivation Test Battery (AMTB) was used to assess the attitudes and motivation of learners towards language learning. The original version of this questionnaire includes 104 items. To get a maximum response rate from the participants, the shortened form of AMTB, including 37 items, developed by Dordinezhad (2015), was adopted in this study.

The questionnaire was offered to the participants in their mother tongue, i.e., the Farsi language because participants in this study were not advanced-level English speakers, so we could not ensure the precision of the results when facing the students with the data collection tools in English. Indeed, the translated version of the tool was validated before administration by a panel of five experts in the field. The reliability of this tool was also assessed via Cronbach's alpha in the pilot test and the actual study. Table 1 presents the results of the reliability check for the mentioned tool. As shown in Table 1, the tool's reliability was 0.74 in the pilot test and 0.78 in the data collection phase. So, the tool was a reliable one for data collection for this study.

**Table 1:** Reliability of AMTB

Questionnaire	Cronbach's Alpha in Pilot Test	Cronbach's Alpha in the Actual Administration
AMTB	0.74	0.78

### 3.3 Data collection procedures

After the participants were at hand through intact sampling in two classes, we selected one class as the control and the other one as the experimental group. Before the course started, a series of preliminary preparations were done. First, the books for the experimental group were prepared and submitted to the institute to be distributed among students. We developed the AR-infused version of the Interchange paper book. For this, we turned some extra input derived from the series' complementary materials into AR multimedia interactive content using ZapWorks, the Zappar workplace.

The AR features added to the coursebook included a variety of multimedia formats, including text, audio, and video. The content was then saved in the platform's repertoire and was accessible to users. After creating and saving each design, a Zapcode was created. We then downloaded and copied the Zapcodes on sticky paper. Before beginning the course, we put the sticky Zapcodes in the relevant places at the top corner of each section to be accessible to learners. Also, we decided to use a minimal number of Zapcodes to avoid unnecessary extra cognitive load on the learners.

The only difference between the conventional course book and the AR-enhanced one was that the latter was augmented with Zapcodes. When the student scanned the code, a virtual audio playing widget was shown on the mobile screen. The learner could see both the real environment and the virtual augmented content on his mobile screen. The virtual content was interactive, which means that the learner could play and pause the audio as he desired. The virtual content was still available if the learner moved his device within a specific range. By moving away from the mark, the virtual content disappeared.

A sufficient number of copies of the book were prepared in this fashion to be used by the participants and the teacher in the experimental group. Since the institute had to provide the students with books and related materials at each level, it was feasible for us to access the coursebooks, get them augmented, and distributed them to the relevant participants at the beginning of the course. The AR features integrated into the books acted like resources that helped learners access more input in different formats, which aided them in learning each lesson section. In fact, AR only modified the way those extra materials were presented to the learners while the content was similar for both control and experimental groups. Also, we provided the experimental group with an in-class high-speed WiFi Internet connection.

Next, the teacher responsible for teaching both groups was informed of the teaching approach she had to take for both classes and was asked to pursue as much similar procedures in both classes as possible to avoid any instructor and instructing effects to the extent possible. Then, she was trained on the AR content, how to access them, and how to re-

solve any probable facility-related flaws that could appear during the experiment.

Then the two groups started the course defined by the institute. In the first session, the teacher described and instructed how to access and use the new AR features the students would experience in the experimental group. She also let the students connect to the Internet connection provided for them and download the Zappar application. She ensured all students could use the Zappar app easily and smoothly. Also, participants were asked to fill out Gardner's (2004) Attitude/Motivation Test Battery (AMTB) in the first session.

Both groups then underwent the 20-session course. After completing the course, learners were post-tested in the final session. The post-test consisted of a re-administration of AMTB to the participants. After the data collection phase, obtained data were analyzed through proper quantitative data analysis techniques, discussed in more detail in the following section.

### **3.4 Data analysis**

Analysis of covariance with SPSS was used to analyze the quantitative data gathered through the study. To observe the effect of AR on the learners' attitudes and motivation in different genders and age groups, we analyzed the results of the data collected through questionnaires at the two administrations using ANCOVA.

Based on SPSS Survival Manual (Pallant, 2007), ANCOVA is used when there is a pre-test post-test design, e.g., comparing the impact of two different interventions, taking before and after measures for each group. The pre-test scores are considered a covariate to control for pre-existing differences between the groups. This feature makes ANCOVA very useful in situations with relatively small sample sizes or medium effect sizes.

## **4. Results**

### **4.1 Participants' demographic information**

According to the obtained data, 50% of participants were males (n=20) and 50% were females (n=20). Their age ranged from 20-40, with dis-

tribution details presented in Table 2. As shown in Table 4.1, 12.5% of the participants were 20-25 years old, 25% were 26-30 years old, 37.5% were 31-35 years old, and the final 25% were 36-40 years old.

**Table 2:** Participants' Age Distribution

Age Range	Frequency	Percentage
20-25 years	5	12.5
26-30 years	10	25
31-35 years	15	37.5
36-40 years	10	25

Analysis of covariance (ANCOVA) was used to respond to the above questions. Before applying ANCOVA, a normality test was done to ensure it was the proper analysis method for the data at hand. Table 3 presents the result of the normality test (Kolmogorov-Smirnoff). As can be deduced from the findings in Table 3 that the significance level obtained in the test (K-S) was more than the criterion value of 0.05. So, it could be concluded that the distribution of the variables under study in the statistical sample was normal, and ANCOVA could suitably be done to respond to the research questions.

**Table 3:** Kolmogorov-Smirnov Test of Normality

Variable	Statistic	Sig.
Attitude and Motivation Post-test	0.171	0.09

#### 4.2 The impact of gender on attitude and motivation

Table 4 shows the descriptive statistics for gender in relation to attitude and motivation. To test whether the difference in means of scores in the two groups was statistically significant, a one-way between-groups analysis of covariance (ANCOVA) was conducted. Participants' scores on the pre-test were used as the covariate in this analysis. Preliminary checks were conducted to ensure that there was no violation of assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate.



**Table 4:** Attitude and Motivation and Gender Descriptive Statistics

Group	Gender	Mean	SD
Control	male	3.64	0.44
	female	3.17	0.47
Experimental	male	4.63	0.18
	female	4.51	0.14

As Table 5 shows, after adjusting for pre-intervention scores, there was a significant difference between the two intervention groups on post-intervention scores on the attitude and motivation test,  $F = 1.569$ ,  $p = 0.219$ , partial eta squared = 0.043. There was no significant difference between pre-test and post-test scores. Therefore, Augmented Reality enhanced both male and female participants' attitudes and motivation levels regarding language learning similarly.

**Table 5:** Attitude and Motivation and Gender ANCOVA Results

Source	Sum Of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected model	18.199	4	4.550	275.363	0.000	0.969
intercept	0.203	1	0.203	12.307	0.001	0.260
Pre-test	3.495	1	3.495	211.542	0.000	0.858
group	1.935	1	1.935	117.122	0.000	0.770
Gender	0.121	1	0.121	7.300	0.011	0.173
Group*gender	0.026	1	0.026	1.569	0.219	0.043
error	0.578	35	0.017			
total	656.557	40				
Correct total	18.777	39				

### 4.3 The impact of age on attitude and motivation

Table 6 shows the descriptive statistics for age in relation to attitude and motivation. To test whether the difference in means of scores in the two groups was statistically significant, a one-way between-groups analysis of covariance (ANCOVA) was conducted. Participants' scores on the pre-test were used as the covariate in this analysis. Preliminary checks were conducted to ensure that there was no violation of assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate.

**Table 6:** Attitude and Motivation and Age Descriptive Statistics

Group	Age	Mean	SD
Control	20-25	3.26	0.48
	26-30	3.08	0.48
	31-35	4.05	0.00
	36-40	3.37	0.36
Experimental	20-25	4.81	0.50
	26-30	4.45	0.00
	31-35	4.51	31-35
	36-40	4.49	36-40

As Table 7 shows, after adjusting for pre-intervention scores, there was a significant difference between the two intervention groups on post-intervention scores on the achievement test,  $F = 2.487$ ,  $p = 0.009$ , partial eta squared = 0.194. There was a light relationship between the pre-intervention and post-intervention scores on the attitude and motivation test, as indicated by a partial eta squared value of 0.194 based on Cohen's guidelines (1988). Consequently, results showed that learners of different ages had their attitude and motivation levels enhanced differently after using AR in language learning.

**Table 7:** Attitude and Motivation and Age ANCOVA Results

Source	Sum Of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected model	18.220	8	2.227	126.570	0.000	0.970
intercept	0.206	1	0.206	11.455	0.002	0.270
Pretest	2.030	1	2.030	112.806	0.000	0.784
group	1.794	1	1.794	99.71	0.000	0.763
Age	0.048	3	0.016	0.895	0.455	0.080
Group*Age	0.134	3	0.045	2.487	0.009	0.194
error	0.558	31	0.018			
total	656.557	40				
Correct total	18.777	39				

## 5. Discussion

According to the results, after the AR learning experience, participants' learning attitudes and motivation in the experimental group were enhanced differently in different age groups, however, their genders had no impact on the way their motivation was enhanced.

It is worth noting that this study was different from those available in the literature because to the best of the authors' knowledge, no previous study examined the impact of age and gender on the enhanced attitudes and motivation of learners in AR-integrated language learning. However, considering the effect of gender and age on language learning motivation in general, the results of the current investigation were in line with previous works of Arslan and ifti (2021) and Altiner (2018) who found that there was no significant difference between male and female students in language learning motivation. However, such results are in contrast to those of Okuniewski (2014), ztrk and Grbz (2013), and Ruyffelaert and Hadermann (2012) who realized that female learners were more motivated than male ones. Also, the results of the present study are in contrast with those of Javid et al. (2012) whose study outcomes revealed male students have higher levels of motivation.

The fact that different studies find different results concerning the impact of gender on attitudes and motivation in language learning might depend on the nature of motivation as a complex concept and also on individual learner characteristics. More research should be done to investigate various learner differences, along with gender, and how they interact with different types of motivation, e.g. intrinsic and extrinsic motivation.

On the impact of age on motivation in language learning, the findings of the current study are in line with those of Becirovic (2017) and Okuniewski (2014) who reported that different aged learners experience different levels of motivation in language learning. However, the current study did not clarify which age group, i.e. younger or older learners, had higher levels of motivation in AR-integrated learning.

The idea that age impacts learners' motivation again depends to a large degree on individual learner differences and different types of motivation. For example, adult learners might experience higher levels of instrumental motivation in language learning because they might need to learn English to use it for their specific purposes, for instance, in their jobs. On the other hand, younger learners might experience higher levels of integrative motivation while learning a language.

In sum, the fact that learners' age impacted language learning mo-

tivation in the specific case of AR-enhanced language learning in this study, in general, can be attributed to the nature of employing technology in learning. In this sense, learners might have different dispositions and attributes about the use of technology in general and various levels of proficiency in technology use might affect learning motivation. For instance, according to Norouzifard et al. (2021), some adult learners do not feel comfortable using technology at all, and in some others, facility issues, such as the device they use to access the AR technology, affect the way they feel about AR-infused learning. To attain more in-depth insights into the nature of learners' attitudes and motivation in technology-enhanced language learning, more research should be done.

## 6. Conclusion

In conclusion, results of the current study denoted that different learner characteristics such as age, affect learning motivation in adult EFL learners in Iran while experiencing an AR-integrated language learning approach. However, the study found no specific relationship between learners' genders and motivation in this mode of learning. According to literature, technology brings unlimited affordances to the language classroom. However, to benefit from these capacities, the way it impacts different learners should be studied more and more, specifically concerning more recently developed types of technology such as AR.

Findings of this study are beneficial to several stakeholders in the field of language education. Policymakers and curriculum developers are suggested to incorporate facilities and related instructions in the language programs to enable the use of AR technology in learning in a way to maximize efficiency for learners of different ages and genders. Also, language instructors are suggested to learn about the way AR impacts different learners and to incorporate this technology in their teaching.

Finally, since AR is newly recognized as a beneficial type of educational technology, more research should be done on the way AR impacts language learning and learners. For instance, the nature of the impact of AR on language learning motivation should be studied in more detail through qualitative methods such as observations and interviews. Also, different learner characteristics and background information, such as

age groups, educational level, and major should be studied to investigate how they interact with the nature of the benefit language learners gain from using AR in learning.

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