

The Effect of Using a Mobile Game-Based Application on Iranian EFL Learners' Pronunciation: Exploring their Motivational Perception

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Abstract

Mobile applications have emerged as promising tools contributing to second/foreign language (L2/FL) learning. This study examined the effect of playing Spaceteam ESL, a game-based mobile application, on FL (English) pronunciation, which is less explored in L2 education. It also explored motivational perceptions of FL learners regarding the game as an effective pedagogical tool. To these ends, 40 female English as foreign language (EFL) students at low-intermediate level from 2 high school classes in Iran participated in the study after taking a placement test. They were assigned into 2 groups: experimental and control groups. In order to measure their pronunciation ability regarding some target English sounds, a researcher-made pronunciation test was administered to the participants as a pretest. The experimental group used the game, in addition to other activities, in the class for 10 weeks; the control group was involved with non-gaming activities. At the end of the treatment, the pronunciation test was given as a posttest. To explore the EFL students' perception of the game-playing, the students in the experimental group were interviewed. The result of t-tests revealed that the experimental group obtained better outcomes than the control group in the pronunciation. The analysis of the semi-structured interview data revealed the students' positive attitude in playing the Spaceteam ESL game and their high motivation for using such games. The findings provide implications and suggestions for students, teachers, and course designers in L2 pedagogy.

1. INTRODUCTION

As evidenced by both anecdotal evidence and a number of studies (Pallier, Colomé, & Sebastián-Gallés, 2019), correctly perceiving and producing the sounds of a second/foreign language (L2) is difficult. As Hismanoglu (2006) states, L2 teachers should give great importance to teaching pronunciation. In L2 teaching and learning, pronunciation plays a crucial role for communication, and it requires the sound system comprehension and production of target sounds (Haghighi & Rahimi, 2017). However, in L2 research, the instruction of pronunciation has taken

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a back seat, compared with such aspects as syntax and morphology (Deng et al., 2009). This secondary role has directed some researchers (e.g., Derving & Munro, 2005) to claim that teaching pronunciation is commonly neglected. According to Hedge (2000), L2 researchers either utterly omitted pronunciation from major publications, or gave limited attention to the topic. However, instruction on pronunciation, as Lee et al. (2019) put it, can be as helpful as grammar, vocabulary, and pragmatics. Moreover, recent research in L2 education has focused on how technology can be integrated most effectively in L2 courses, including pronunciation courses (Fouz-González, 2018). Researchers are interested in the use of recent technology as a promising tool, because it can improve presentation styles and make instructional materials more psychologically and physically available (Pennington, 1996), provide students with individualized practice and with many tries, and offer them automatic and immediate input on their actual performance (Fouz-González, 2018).

According to Hsu (2016), the ever-going technology development over the past decades has changed language learning and teaching landscape. Greatly developed digital literacy skills of learners and great range of technological applications permit a new way to teaching foreign languages in general, and teaching L2 pronunciation in particular. In integrating digital technologies into learning/teaching environments, some Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) researchers develop or use game-like practice or activities for learning of language. Students involving in such practice are given activities and expected to achieve them by working in CALL and MALL environments such as virtual worlds (Zheng, Young, Brewer, & Wagner, 2009) or by playing a mobile game (Reinders & Wattana, 2014). Playing games can help students gain knowledge of the world (Coyne, 2003).

Investigations on mobile game-based learning can also focus on the motivational effects of the methods. In L2 learning, motivation is crucial because it provokes, directs, and keeps better performance in learning (Boo, Dörnyei, & Ryan, 2015; Chang, 2005). Motivated students devote more effort to their L2 learning; they persevere more even if the long process of L2 learning is difficult and allocate more time and energy to doing so (Ushioda, 2013). Some MALL scholars (e.g., Ena, 2003) have asserted that mobile applications can enhance students' motivation for L2 learning. As an instance, Sandberg, Maris, and de Geus (2011) claim that learners are motivated to utilize a mobile phone application to learn English outside the class even if they are not required to do so. More specifically, using various interesting activities through games may improve the learners' English pronunciation ability (Nurhayati, 2015). Games might also be effective because they lower learners' stress and give them the opportunity for real communication. Despite their benefits, the integration of digital games into formal L2 education is still rare and different problems have been recognized. The most notable problem is that there is little acceptance of games as pedagogical means among most of L2 teachers (Wastiau, Kearney, & Van den, 2009). Some teachers consider games as leisure time activities without any instructional value.

Facing the demanding work environment due to the needs of English learning in the educational context of Iran, EFL teachers might struggle to find alternative methods to foster development in learners' pronunciation and motivate learners in an engaging and playful atmosphere. In this way, game-based learning may be promising. Given the potential effect of game-based instruction on L2 pronunciation and motivation, the present study sought to investigate the possible effect of a game, called the *Spaceteam ESL* on L2 learners' pronunciation and explored their motivational perceptions of the game.

2. LITERATURE REVIEW

Teaching Pronunciation

Historically, pronunciation as an aspect of L2 learning developed with the audio-lingual method and situational language teaching, both of which considered it as a vital language component (Morley, 1991). These two approaches used articulatory explanations, imitation and pattern drills, with a major emphasis on correction. As Morley (1991) asserts, they abandoned the method of articulatory explanations and replaced it by a more communicative and functional method. In the 1960s, the importance of teaching pronunciation was gradually questioned. At this time, many curricula put less emphasis on pronunciation or drop it from syllabi (Morley, 1991). An example is the cognitive approach that put great emphasis on grammar and vocabulary rather than on pronunciation (Celce-Murcia, Brinton, & Goodwin, 1996). Later, in the 1970s, teaching pronunciation was discussed theoretically and extensively. The 1980s was characterized by a new interest in pronunciation teaching, influenced by the notions explored theoretically in the previous decade. One of the methods that gave importance of pronunciation was the communicative approach. Giving a great emphasis to effective communication, the communicative approach focused on the need to help L2 students attain a certain level of pronunciation skills, that is, a threshold above which the communication is not distorted by misunderstandings caused by an incorrect pronunciation (Celce-Murcia et al., 1996).

Mobile-Assisted Language Learning

In the 1950s, the advent of audiolingual method brought about the tremendous utilization of language laboratories in academic environments (Salaberry, 2001). Along with the development in technology, as Chinnery (2006) maintains, the laboratory was increasingly substituted with drill-based computer-assisted instruction in the 1960s, which was overshadowed, decades later, by multimedia, interactive, and intelligent CALL. In the 1990s, according to Chinnery (2006), the widespread endorsement of the Internet gradually promoted the expansion of Computer-Mediated Communications (CMCs), and technologies with larger capabilities (e.g., emails, videoconference, and network communication) started to emerge. These rising technologies have been characterized by their ease-of-access, feasibility, mobility, and transportability.

During the chronicle of educational technology, there have been tendencies dealing with capabilities and size of technologies, which support instruction in the class. Small technological devices such as mobiles to able to do as much as, and even more than, large computers. Characteristics such as mobility, portability, and availability have made the expansion of mobile language learning applications and tools possible (Al-Zahrani, 2015), resulting in the development of MALL. Some researchers (e.g., Viberg & Grönlund, 2012) categorize MALL as a sub-branch of m-Learning (mobile-learning), while others believe that it is a subset of the CALL domain. According to Joseph and Uther (2006), what makes MALL extend the CALL field into everyday activities is the mobility feature of MALL. As Viberg and Grönlund, (2012) contend, MALL is a sub-branch of m-learning that has progressively attracted the interest of some researchers. For instance, Huizenga, Admiraal, Akkerman, and Dam (2009) and Su and Chengt (2015) have developed game-based learning activities in education and gradually the term gamification has emerged in the literature. In fact, gamification is a new term referring to the use of game mechanics and game design elements in non-game contexts with the aim of engaging individuals and solving problems. It tends to be a solution for involving them in sustainable behaviors, like exercise, practice, and instruction (Girard, Ecalle, & Magnant, 2013). Based on research, gamifying a course can be very helpful for school students (Sandberg, Maris, & deGeus, 2011). By keeping the

motivational power of games into consideration and implementing it to the motivational problems in teaching, more learning achievement can occur (Prensky, 2001).

Many game applications have been designed in recent years, including *Conjugation Nation*, *Edugame*, *Frequency 1550*, and *Massively Multiplayer Online Role-Playing Game (MMORPG)*. The *Frequency 1550*, as an example, is a Dutch game working in cultural and social domain. It is a mobile game in which pupils acquire historical knowledge about medieval Amsterdam. Groups of four or five are formed to obtain citizenship in the Amsterdam city via getting the required points or days of citizenship (Huizenga, Admiraal, Akkerman, & Dam, 2009). *MMORPG* is a type of popular digital game played by many players in a complicated environment which needs a substantial amount of player interaction to progress in the game (Reinders and Wattana, 2015). Another popular game application is *Spaceteam ESL*. As Grimshaw and Cardoso (2018) explain, *Spaceteam ESL* is a portable and easily accessible mobile application with such features as CMC, practice of common terms, time-dependent interaction. This game can create a learning environment for learners to practice English. In their study, Grimshaw and Cardoso (2018) investigated the possible effect of the *Spaceteam ESL* on oral fluency and perceptions of 20 Canadian English as Second Language (ESL) learners. They observed changes in the Canadian ESL students' oral fluency (i.e., judges' ratings and syllables produced each minute). Moreover, the gameplay positively influenced the ESL learners' willingness to communicate and reduced their anxiety.

Also, there has been an increasing demand to use technology with special emphasis on pronunciation. For instance, Fouz-González (2020) conducted a research to explore the potential of a digital application, *English File Pronunciation (EFP)*, to help 47 advanced Spanish EFL learners to improve their production and perception of some sounds that were likely to be fossilized in the interlanguage of the Spanish EFL learners. The results of pre- and posttest revealed that although the difference between the group that used the mobile application and the one that did not use it was not statistically significant for the target sounds, the application improved the learners' production and perception of the segmental sounds.

There are a number of studies on MALL and L2 skills, such as listening (e.g., Liu & Chu, 2010; Miangah & Nezarat, 2012) and speaking (e.g., Grimshaw & Cardoso, 2018), L2 interaction (Reinders and Wattana, 2015), and academic achievements (e.g., Su & Chengt, 2015; Partovi & Razavi, 2019). Despite tremendous empirical studies done in the MALL domain, the effect of game-based applications on L2 pronunciation domain has given less attention. A close look into literature indicates that there is little empirical research on the effect of *Spaceteam ESL* application on English pronunciation, which is the focus of the present study.

Motivation

Deriving from the Latin word *movere*, motivation is defined as what moves an individual to make a certain decision, to engage in an action, to spend effort, and to persevere in action (Dörnyei & Ushioda, 2011). Research on language learning motivation has witnessed more than 50 years of ongoing history and has observed different phases of progress, with major milestones such as Gardner and Lambert's (1972) views of motivation. Gardner and Lambert highlighted the significance of attitude and culture in language learning and introduced integrativeness, a notion which relates to the desire to integrate and learn more about another culture, and instrumentality, which relates to the functional value of learning a language (i.e., job purposes). Gardner's view and his social approach were so dominant than other motivation views existing before the 1990s. However, Gardner's theory failed to take the new conception of social identity into account. Thus, new studies on motivation started to emerge. Cognitive traits proved to have great importance in

educational settings, and L2 researchers employed them in L2 teaching and learning. This way, the cognitive viewpoints, namely, attribution and the self-determination theories, emerged.

These emerging theories and approaches stressed the notion of intrinsic and extrinsic motivation (Ghapanchi, Khajavy, & Asadpour, 2011). Intrinsic motivation was described as the fulfillment of learning for personal desire and satisfaction, whereas extrinsic motivation was associated with external regulations like rewards, choiceful behavior, and forced rules (Dörnyei, 2001). The reconceptualization of the L2 motivation has occurred in recent years. Now, the recent views of motivation embrace both the learner's social context and view of the self as components linked to L2 motivation. In actual fact, because there was dissatisfaction with the more traditional model of L2 motivation, the L2 motivation theories have been reconceptualized. As Ebrahimzadeh and Alavi (2016) maintain, the traditional models considered motivation as a linear phenomenon while motivation results from a sequence of multiplex interactions. Moreover, they took a reductionist perspective toward motivation, describing a series of specific variables that would predict motivation. The socio-dynamic views, however, considered the complication of the process of the L2 motivation and its circular change in dynamic interaction with a variety of contextual, internal, and social factors whilst taking into account the greater complication of language learning and language use in the globalized world. That is to say, motivation could not be defined and identified without recognizing the interactions and relationships between the various fundamental motives in the context. Moreover, persons' thoughts and their perceptions toward the context change over time. This issue emphasizes that motivation is a dynamic phenomenon.

Taking the importance of motivation into account, L2 researchers are continuously involved in implementing effective and interesting teaching strategies and methods to encourage language learners to learn and enhance their motivation. Naturally, some scholars (e.g., Sudarmilah et al, 2020; Cho & Castaneda, 2019) have made attempts to incorporate the mobile devices in language teaching practice. Cho and Castaneda (2019), for instance, investigated if any changes would occur in Spanish learners' affective and motivational engagement in L2 after engaging in game-like activities with the *Conjugation Nation* application. *Conjugation Nation* is a mobile application developed to promote grammar learning in the Spanish language. To that end, 82 learners of Spanish in six classes in a university in the US took part in the study during four semesters. The results indicated that the game-like practice with the *Conjugation Nation* was partially useful in increasing positive affect. The participants largely noted that the activities were helpful and enhanced their enjoyment of learning Spanish. Their study supports the contribution of gameplay in language learning. Also, Kétyi (2013) asserts that learners can gain additional learning time out of the classroom, be motivated, and develop their language learning if their teachers incorporate the mobile devices in language teaching practice. Further research shows that integrating mobile game-based applications in learning environment has the potential to enhance learners' motivation and encourage language learning. For instance, Ebrahimzadeh and Alavi (2016) carried out an experimental study to examine the effect of utilizing digital games for learning English vocabulary as a means to motivate EFL learners and create enjoyment. They found that the Iranian EFL learners who were engaged in the digital gameplay enjoyed learning vocabulary, which considerably improved their motivation to learn English. Likewise, in a prior study, Schwabe and Göth (2005) conclude that technology could enable learners to engage into a mixed reality and, consequently, provide motivating learning experiences. According to them, mobile games can push learners into a state in which they are mentally prepared for learning.

Despite the enormous research done in MALL, there is scarce evidence of pedagogical implementation of the game-based application in L2 pronunciation development and motivational outcomes, particularly in the EFL context of Iran. Many Iranian high school EFL students,

particularly at the low level of proficiency, have problems with the pronunciation of some English sounds, such as [w], [θ], [ð], [u:], [ʊ], [i:], and [ɪ], which do not exist in Persian. It is then promising to look into the effect of using game-based instructions on high school students' English pronunciation accuracy and motivation, and fill the existing gap in the L2 gamification and pronunciation studies. The current study was intended to examine the effect of playing *Spaceteam ESL*, a mobile game-based application on low-intermediate high school students' English pronunciation accuracy. Also, it sought to explore the high school students' views about the *Spaceteam ESL* game application as a means to enhance their motivation. In line with these objectives, this study provided answers to the following two questions:

Does playing the *Spaceteam ESL* game improve English pronunciation accuracy of Iranian low-intermediate high school EFL students?

What are Iranian low-intermediate high school EFL students' perceptions of the *Spaceteam ESL* application as a means to enhance their motivation?

3. METHOD

Participants

The study was carried out with a sample of 40 Iranian EFL students from 2 classes in Andika, Khouzestan, Iran. They were female high school EFL students aged between 17-19 years old, with a mean age of 18. They were studying English in the high school and had not taken any course on learning pronunciation in language institutes. They were selected after taking a language placement test. They were at the low-intermediate level. Half of the participants were in the control group (n = 20) and the other half were in the experimental group (n = 20).

Instruments

The instruments were a placement test, a pronunciation test, and a semi-structured interview. In order to ensure the homogeneous entry of the students, a placement test, Quick Placement Test (QPT, 2001), was initially administered to measure the participants' English language level. The test consisted of 60 items in multiple-choice format, measuring vocabulary and grammar knowledge.

A researcher-made pronunciation test was developed to measure students' pronunciation ability before and after treatment. It was used as the pretest and posttest. This test focused on the segmental features such as sounds, [w], [θ], [ð], [u:], [ʊ], [i:], and [ɪ]. which were absent in Persian. The pronunciation test had 45 items and consisted of three parts: In part one, the participants listened to an audio file and marked the word they heard in the audio. In part two, the participants listened to several sentences and selected the correct pronunciation of the underlined words. In part three, the participants were required to read some words (minimal pairs such as 'slip' vs 'sleep' or 'fill' vs 'feel') with correct pronunciation with their voices being recorded. The total score for the pronunciation test was 45, and time allocation was 30 minutes. The content validity was checked by experts' judgments. The test content corresponded to pronunciation features of their high school textbook, *English for Schools, Vision 3* (Alavi Moghaddam, Kheirabadi, Rahimi, & Davari, 2020) taught in high schools in Iran. The test received coverage of the segmental features of pronunciation covered in the program. As to the reliability of the test, the test-retest reliability of the test in a pilot study with 30 high school students, who were similar to the EFL participants, was high (.75). Also, the Kuder-Richardson 21 index for parts 1 and 2 of the test was found to be acceptable (0.80). In addition, the interrater reliability for the part 3 of the test was high (.98).



Figure 1: A screenshot of the two phases in the *Spaceteam ESL* gaming application.

In order to explore the participants' views about the *Spaceteam ESL* application as a pedagogical means, a semi-structured type of interview was conducted with the participants in the experimental group. It included several open-ended and yes/no questions such as "How do you evaluate your experience of using the *Spaceteam ESL* game?", "How did you find the method employed in this course? Was it interesting or not? Why?", and "Did the class encourage you to keep going in your improving pronunciation? If so, how?". Two experienced instructors to have feedback on their appropriateness, clarity, and relevance reviewed the questions.

Procedure

A pretest-posttest control group design was employed; it consisted of two groups: treatment and control. At the beginning, the placement test was used in order to check the English language level of the participants ($n = 40$) and ensure their homogeneity at the entry level before they receive the instructions of the study. Their scores fell within 30-39 (low-intermediate level). The participants in one class were assigned as the experimental group ($n = 20$) and the participants in another class were assigned as the control group ($n = 20$). The experimental group were exposed to the game (*Spaceteam*) once a week for ten weeks. At the start of each session, they were engaged in the gameplay for 30 minutes. *Spaceteam ESL* is a double-mode game. In the first mode, the students/players were provided with a list of vocabularies consisting of the most-frequently-used vocabularies on their mobile screen. An automated word producer produced the words in native English. The students were then expected to repeat the same vocabularies. In the second phase, the same lexicon in the word list appeared in the game while the students were playing. Figure 1 displays the two phases of the game in the application.

In order to make the participants understand the course objectives and get familiar with the *Spaceteam ESL*, they had a training session. By using this application, the experimental group was set up for students to play in teams of four. Then, they installed the *Spaceteam ESL* application on their smartphones or tablets in order to keep a spaceship running. The participants in the experimental group interacted with each other as a group to accomplish the game. As the game level increased, the word complexity, in terms of frequency level of words and difficulty level in pronunciation increased. They interacted to send and receive instructions in a limited amount of time. If there were any misunderstanding, the student-interlocutor regularly repeated the wrong word or mispronounced vocabulary to ensure if it was the target one. The written instructions on the screen provided more clues for interpreting their classmates' response. The student-

interlocutors were able to give peer input on what was read and heard. The interlocutor was able to identify and pronounce the correct form again.

The students in the control group took part in traditional activities commonly used in such classes, including listening to the target sounds and imitating those sounds. In this way, the teacher provided them with clear distinction between different aspects of pronunciation such as the position of the tongue, manner and place of articulation. Moreover, they completed paper-based supplementary materials in which they practiced listening to the sounds (i.e., vowels and consonants), producing those segments, and completing correct phonetic symbol for vowel and consonant segments.

After 10 weeks, the pronunciation test was given to the EFL students in the experimental and control groups as a posttest to see whether the game-based instruction had a significant effect on L2 pronunciation after the intervention. For the posttest, the test item order was reshuffled. Then, the students in the experimental group took part in the semi-structured interview.

The investigation consists of two distinctive phases: quantitative followed by qualitative. Quantitative data collected through the pronunciation pretest and posttest were analyzed by SPSS (version 25) and *t*-tests were run to assess the group difference on the pretest and posttest. In order to interpret the qualitative data, the results of the interview were transcribed and coded and the researchers identified themes.

4. RESULTS

The First Research Question: The Effect of the *Spaceteam ESL* Game

The first research question was formulated to gain information about the role that using the *Spaceteam ESL* application played on improving the pronunciation accuracy of Iranian EFL students at low-intermediate level. Table 1 shows the descriptive statistics results regarding pretest and posttest pronunciation scores obtained by the participants in both groups.

As Table 1 shows, the pronunciation mean score of the students in the control group ($M = 10.29$, $SD = 2.61$) was not greatly different from the pronunciation mean score of the students in the experimental group ($M = 11.10$, $SD = 2.45$). Also, the skewness and kurtosis data revealed that the assumption of normality was observed in the distribution of the pronunciation scores of the two groups. However, the score differences between the two groups and the assumption of parametric test was tested statistically. The Kolmogorov-Smirnov tests of normality on the pronunciation pretest and posttest scores showed no significant violation in both groups. The scores were normally distributed for both groups in the pretest, as found to be $D(20) = .138$, $p > .05$ in the control group and $D(20) = .128$, $p > .05$ in the experimental group. The data of the control and experimental groups in the posttest were also found to be suitable for parametric tests, $D(20) = .128$, $p > .05$ and $D(20) = .129$, $p > .05$ respectively.

Table 1: Descriptive Statistics of Pretest and Post Pronunciation Scores

Group	Variable	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
Control	Pretest	8	13	10.29	2.61	-.32	.51
	Posttest	13	26	21.72	1.24	-.27	.52
Experimental	Pretest	9	13	11.10	2.45	-.27	.51
	Posttest	19	39	34.86	1.53	-.28	.52

Table 2: Independent t-Test on the Pronunciation Pretest Mean Scores Between the two Groups

	F	Sig.	t	df	Sig.	Mean Difference	95% Confidence Interval	
							Lower	Upper
Equal variances assumed	21.22	.720	.151	38	.881	.81	2.05	2.24
Equal variances not assumed			.151	41.5	.881	.81	2.06	2.25

Table 3: Independent t-Test on the Pronunciation Posttest Mean Scores Between the two Groups

	F	Sig.	t	df	Sig.	Mean Difference	95% Confidence Interval	
							Lower	Upper
Equal variances assumed	1.307	.003	9.21	38	.000	13.14	1.21	1.50
Equal variances not assumed			.151	51.48	.000	13.14	1.21	1.50

Also, independent *t*-tests were run on the pronunciation mean scores of the control and experimental groups in the pretest and posttest to examine whether the difference between two groups in the pronunciation means were statistically significant. The results of *t*-tests are illustrated in Tables 2 and 3.

As Table 2 indicates, there was not a statistically significant difference in the pronunciation means of the students between the two groups in the pretest, $t(38) = .151, p = .881$, meaning that there was no significant difference between the two groups in the pronunciation before instruction. However, the results demonstrated that there existed a significant difference between the two groups in the pronunciation achievement after instruction. As Table 3 illustrates, a statistically significant difference was observed in the pronunciation means of the students who used the *Spaceteam ESL* application and the students who did not use a game application, $t(38) = 9.21, *p < .05$. The experimental group was better than the control group in the pronunciation gains in the posttest. Also, as the results of the paired *t*-test shows (see Table 4), the experimental group had a significant gain in pronunciation accuracy from the pretest phase to the posttest phase. They received significantly higher pronunciation scores in the posttest, $t(19) = -20.02, *p < .05$.

Table 4: Paired t-Test on the Pronunciation Pretest and Posttest Mean Scores

	Mean	Std. Deviation	Std. Error Mean	Paired Differences		t	df	sig.
				95% Confidence Interval of the Variance				
				Lower	Upper			
Pretest-Posttest	-23.76	.92	.40	-1.46	-2.38	-20.02	19	.000

The Second Research Question: Perceptions of the *Spaceteam ESL* Game

In order to address research question 2, thematic analysis of the transcribed data from the experimental students were conducted. Six themes emerged inductively from the transcription of interviews. The main themes include atmosphere, social interaction, encouragement, facilitation, anxiety, and challenge.

Atmosphere. The interviewees mentioned the fun atmosphere of the classroom. Some students reported that the attractive nature of the classroom encouraged the learners to pursue and finish the class time without feeling of discomfort, whereas the classrooms (traditional ones) discourage the learners: One student (Maryam, 17 years old) said, “I think the application was great because the students prefer to use a mobile phone. This program is very efficient ... the pressure is high when we have merely the textbook-based teaching. Another student (Fatemeh, 17 years old) explained, “This program was very effective in teaching the language since it created a kind of fun and, I think, all of the students liked learning English by using the application ... it is attractive.” Also, some participants said that the course was a new experience in English classes. One student (Zahra, 17 years old) mentioned: “It is very fun and interesting, ... and I could not feel the passing of the time while playing the game. Last year, the English class was boring, but this class was a new experience ... I hope games can be used in the future.”

Social interaction. The participants also spoke of collaboration and peer interaction aspect of the *Spaceteam ESL*. Interaction with peers in a context free of anxiety was the reason that the participants referred to. One of the students (Somayeh, 18 years old) stated, “The game helped me to interact with other students and pronounce the sounds native-like”. The social interaction aspect of the *Spaceteam ESL* application assisted the participants in the experimental group to improve their pronunciation. As a female student (Maryam, 17 years old) explained: “I liked the game. I like to speak with other people. The game helped me interact with my classmate who was at the same level and improved my pronunciation”. This issue was highlighted by Kobra (a 17-year-old student): “The game experience facilitated interaction with peers and created a good learning environment. It helped me have communication with my classmate in the class and, as a result, practice my pronunciation.”

Encouragement. Some of the interviewees demonstrated positive attitude towards the game-based instruction and believed that *Spaceteam ESL* encouraged them to learn English better and improve their pronunciation. One student (Parinaz, 18 years old) stated, “I think some students, including me, did not like learning English, but the game-based teaching method has encouraged us to learn English and improve our pronunciation.” Other students also viewed the game-based instruction as an encouraging factor: “Such games are interesting and encouraging for students.” (Hamideh, 17 years old). Another student specified her reasons as follows: “Playing the game encouraged me a lot to focus on my pronunciation improvement. Such applications can encourage students to learn pronunciation and internalize the teaching content.” (Giti, 19 years old)

Facilitation. Some of the students in the experimental group noted that the native-like pronunciation features such as accent observed in the game application could facilitate the process of pronunciation acquisition/learning. One student (Maryam, 17 years old) said, “I love this game-based application ... the process of pronunciation acquisition is facilitated ... A good way to be active is using such games. It can be used outside the class to improve my accent and vocabulary pronunciation .” Another student viewed oral output as a factor that helped her to facilitate the process of pronunciation acquisition: “It feels good to play such games... we practiced the pronunciation of sounds and new words we did not know ... the oral output provided by the game helped me facilitate the difficult process of learning pronunciation.”

Anxiety. Some students also claimed that the game reduced the degree of their anxiety, enabling them to exercise their pronunciation with their classmates without stress. A Low level of students' anxiety, as reported by some participants, was due to teamwork and enjoyable atmosphere in the class during the course. This was explained by one student (Marziyeh, 18 years old): "Most of the time I felt kind of stress and anxiety in English classes before, but this course was different. There was laugh, teamwork, and enjoyment during the course". In the same way, Maryam (17 years old) mentioned, "Sense of laugh and group work made me feel good and reduced my anxiety ... I practiced the correct pronunciation of some sounds."

Challenge. Some of the interviewees (30%) reported that game-based instruction was a challenge for them. They reported that using such applications in the class was challenging and exciting though it was time-consuming. They believed that it involved a lot of effort and time. They said that playing the game was a lengthy process, but it was motivating. This issue was described by one student (Malihe, 19 years old): "Although I was faced with a lack of time in the class when I was engaged with the game, I liked it...it was stimulating and kind of challenge for me ... I wanted to complete the game". Another student (Shadi, 17 years old) commented, "I liked it ... it was challenging and exciting. I learned a lot. I learned how to pronounce some English sounds correctly. I would like to play such challenging games and activities again."

5. DISCUSSION

Research question 1 was intended to examine the effect of playing *Spaceteam ESL* on English pronunciation among a sample of Iranian EFL learners. The results provided supporting evidence for the effectiveness of game applications in improving EFL learners' pronunciation accuracy. Data analysis in the quantitative part showed that using the *Spaceteam ESL* application had an effect on the accurate pronunciation of English sounds, such as [w], [θ], [ð], [u:], [ʊ], [i:], and [ɪ]. One justification for pronunciation development is peer interaction and more oral output by the students in the experimental group. As the results in the qualitative part verified this issue, social feature of the game allowed the high school participants in the experimental group to speak with each other more and assisted them to produce more oral output, resulting in more pronunciation improvement. These high school EFL participants could practice their pronunciation in an interactive way and receive feedback from their classmates based on their success or failure in the gameplay. This justification can be in harmony with the prediction of Swain's (2000) hypothesis, claiming that learners learn through oral practice and output in their own L2. The students could correct their pronunciation during the gameplay. The game had pedagogical elements to entertain and train the students through different modes with regard to their pronunciation. The results about the effectiveness of the *Spaceteam ESL* game are partially in congruent with the findings of the prior research. Reinders and Wattana (2015) examined the effect of a digital game used in L2 education, namely, *MMORPG*, on interaction of 30 Thai learners of English. They concluded that compared with interaction in class, the online gameplay resulted in a larger increase in English interaction. Grimshaw and Cardoso (2018) also reported that playing the *Spaceteam ESL* game improved Canadian ESL learners' oral fluency and willingness to communicate.

Additionally, playing *Spaceteam ESL* game made the participants in the experimental group to repeat the English sounds and create a link between ear (listening) and tongue (pronunciation). Thus, the other justification for the effectiveness of the game in pronunciation development was a meaningful repetition feature demonstrated in the gameplay. As Turgut & Irgin, (2009) maintain, the natural repetition in learning games permits language learners to be persistently exposed to the target language, providing more opportunities for language acquisition to occur. Besides, attention should be paid to such aspects as native-like accent observed the *Spaceteam ESL* game. The participants pointed out features such as accent that stimulated them to repeat the target words and

facilitated the process of pronunciation acquisition/learning. The first phase of the game provided a great amount of aural input for the participants. The players could press one button and listen to the vocabulary and press another button and imitate the target vocabulary several times. As some learners contended, the input produced by the application was heavily accented native-like, which helped them improve their pronunciation.

As to research question 2, the qualitative data analysis suggested that the interviewees accentuated the fun and attractive atmosphere of the classroom. Reportedly, the attractive, fun, and pleasant atmosphere of the classroom encouraged them to pursue their activities and finish the class without feeling of discomfort, whereas such features were less observed in the traditional class. Gameplay used in the class was a novel experience for them and made them interested in pronunciation development. These aspects are also highlighted in Cho and Castaneda's (2019) study. They reported that the *Conjugation Nation* game was effective and considerably improved Spanish students' satisfaction after participating in game-like activities. They also pointed out the importance of attractiveness and fun nature of the class in which students played the *game*. Presumably, playing the game made the high school students in the experiment group of the study engaged, motivated and active in learning English pronunciation. This issue can correspond to the benefits of using technology in L2 learning. With the game-based instruction, their classroom became more student-centered, resulting in developing learner-centered learning.

The results revealed the role of games in reducing levels of anxiety and stress in foreign language pronunciation development. Teamwork, peer interaction, and fun atmosphere created as the result of using the game contributed to the low level of anxiety among the participants in the experimental group and, accordingly, facilitated pronunciation development. As Grimshaw and Cardoso (2018) maintain, the fun aspect of mobile gaming may aid learners to have a low level of anxiety, which is important for L2 pronunciation acquisition. The results also stressed elements such as challenges. That is to say, the game offered different difficulty levels and time limitation. The game-based instruction was a challenge for many of them. Conflict and challenge are primary elements of games that evoke players' arousal and make them feel creative, motivated, and exited (Prensky, 2001).

6. CONCLUSION AND IMPLICATIONS

The main aim of the study was to look into the possible effect of game-based instruction on the English pronunciation accuracy of high school students at low-intermediate level, and explore the motivational perception towards the game. To this end, this study used the *Spaceteam ESL* application. The results showed that the game-based instruction was effective and improved the EFL learners' pronunciation more than the traditional instructional method. By using the *Spaceteam ESL* game, the learners could create a link between ear (listening) and tongue (pronunciation). Using the *Spaceteam ESL* application helped the high school EFL students practiced the pronunciation of English sounds with a driving force. In addition, the results of the interviews revealed the applicability and attractiveness of this game application in increasing EFL learners' motivation. In the light of the emerging themes, it was shown that using such games as *Spaceteam ESL* could create a fun atmosphere in the classroom, lead to social interaction with peers, encourage EFL students to better their pronunciation, facilitate the process of English pronunciation acquisition, reduce anxiety level and stress, and stimulate them to accomplish the challenging game task.

This current study highlights the role of technology in L2 learning and contributes to broadening our understanding and consideration of motivational perceptions and serious engagement in MALL. The results can help L2 researchers extend gamification research to other aspects of L2 learning. The above findings can also have implications for L2 teachers. Based on the findings,

pedagogical games can offer advantages in L2 classes. L2 teachers can use games such as the one used in the present study as a supplement to other instructional materials in their L2 pronunciation programs. The results suggest that teachers can integrate the game with other audio and visual instructional materials to develop L2 pronunciation. In this way, they can support their students' active participation in the process of learning pronunciation in the target language in the classroom. Additionally, game-based instruction can stimulate L2 learners to enjoy the demanding pronunciation tasks in the process of learning L2 pronunciation. The findings imply that L2 teachers can employ gameplay to make their students experience a more pleasant and entertaining atmosphere in the L2 classroom. It is thus recommended that curriculum developers, materials writers, and course designers pay attention to the role of gameplay, game-like activities, and mobile-based activities in L2 teaching/learning and developing corresponding materials and curriculums.

Like many other studies, this study is not free from limitations. Sampling size is the first limitation. The number of participants was not large in order to make strong generalizations to the population of EFL learners. The second limitation is the level of the EFL learners which makes the generalizability to the other learners at a different proficiency level difficult. Furthermore, no randomization was possible in the study and the participants were from intact classes; this issue might also limit the generalizability of the data. Third, the study was implemented with a limited number of sessions. The length of the course may affect the findings. Thus, the results need to be interpreted cautiously. Finally, this study focused on the segmental aspect of pronunciation. Future researchers can validate the above findings by examining the role of game-based instruction with regard to different aspects of L2 pronunciation, utilizing different mobile applications over a long period of time and with learners at different L2 proficiency levels.

Declaration of Conflicting Interests

There is no conflict of interest to declare.

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