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The effect of interactive games on English language learners' reading comprehension and attitudes

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Abstract
This study investigates the effect of interactive games on improving reading comprehension skills and attitudes toward games among Iranian learners of English as a foreign language. In this quantitative study, the participants in the control group received reading comprehension instruction through traditional models of teaching reading while the participants in the experimental group developed their reading skills through participating in interactive games. A reading comprehension test was administered as a posttest. The mean performance of the two groups was compared by performing an independent-samples t-test and a paired-samples t-test. The analysis revealed that participants in the experimental group ($N = 30$, $M = 26.33$, SD = 2.80) significantly outperformed those in the control group ($N = 30$, $M = 16.80$, SD = 3.71) in the posttest. Moreover, an examination of the participants' perceptions showed they have a positive attitude toward games. The findings of this study suggest that interactive games are powerful tools for improving student engagement, motivation, and learning outcomes in the classroom. The study also provides some practical suggestions for further research.

Keywords Attitude · English as a Foreign Language (EFL) · Interactive games · Language teaching · Reading comprehension · Sociocultural theory

Introduction

Reading is a key skill in language learning (Tümen Akyıldız & Çelik, 2021). According to McCarron and Kuperman (2022), "[a]s reading is one of the most fundamental competencies in modern-day society, reading proficiency among postsecondary students has far-reaching academic, social and economic implications" (p. 43). Luciano (2017, p. 147) also highlights that "reading is the cornerstone of all educational systems." Despite its importance in educational settings, reading comprehension is considered a severe challenge that learners face at a tertiary level (Dreyer & Nel, 2003; Elleman & Oslund, 2019; Erya & Pustika, 2021; Hanushek et al., 2015). Unfortunately, in many educational settings, reading comprehension instruction is limited to traditional practices, including translating texts to learners' native language or memorizing the reading passages (Shawer, 2012). However, higher-order skills, such as analyzing and synthesizing reading passages, have not been paid sufficient attention in educational settings (Soysal, 2022). Similarly, Barber and Klauda (2020, p. 27) argue that "[s]uccessful reading comprehension demands complex cognitive skills, and, consequently, motivation to make meaning from text." Furthermore, Elleman and Oslund (2019) consider that "[r]eading comprehension is one of the most complex cognitive activities in which humans engage, making it difficult to teach, measure, and research" (p. 3). As a result of inappropriate policies and practices, McCarron and Kuperman (2022) conclude that, in the academic setting, "many graduates are below literacy expectations" (p. 46). To help solve this problem, some scholars have proposed the use of 'games' as an effective experimental intervention in developing learners' reading comprehension (Hooshyar et al., 2018; Nurjanah, 2018). Kapp et al. (2014) stated that the gamification[1] of learning is an educational approach that increases learners'

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[1] According to Lämsä et al. (2018), "[g]amification aims at fostering playful and gameful attitudes, which are considered beneficial for learning.".

interest in English using video games in the classroom. For Lämsä et al., (2018, p. 598), "[g]amification refers to the practice of applying game elements or functionalities such as points, rewards, tasks, challenges, goals, or immediate feedback for learning purposes."

Games are motivating activities, and many researchers have encouraged using them because of their educational advantages (Hooshyar et al., 2017; Shaker et al., 2014; Yolageldili & Arican, 2011). In language classrooms, learners more often than not feel anxious because of peer pressure and affective factors. Moreover, when learners make mistakes, they become very anxious about being punished and criticized by their instructors. Therefore, games benefit language learning by reducing stress, enhancing positive feelings, and improving self-confidence (Lee, 2020; Peterson, 2010).

In addition, games help learners develop the target language subconsciously. When instructors thoroughly concentrate on a game as an educational activity, learners learn the target language indirectly, in the same way they acquire their first language (Lee, 2020; Oxford & Gkonou, 2018). This is likely to happen because, in interactive games, learners actively acquire knowledge and monitor their performance. Games' make a unique contribution by providing a meaningful context for learners to apply what they have learned (Godwin-Jones, 2014; Ranalli, 2008; van de Ven et al., 2017).

Considering the merits of interactive games, this study explores the effect of games on learners' reading comprehension and attitude in the L2 context (i.e., private language institutes in Iran). Specifically, this study probes the effect of interactive games under experimental conditions to answer the following research questions: (1) What is the effect of interactive games on Iranian EFL learners' reading comprehension skills? (2) How do interactive games affect Iranian EFL learners' attitudes?

This experimental study innovatively investigates the role of interactive games in improving Iranian EFL learners' reading comprehension skills and attitudes toward games. This study is motivated by insufficient attention given to the effect of games on language learners' motivation and attitudes about learning with games.

The study is organized as follows: "Literature review" section discusses game-based learning and its effect on language learning and conducts a literature review of recent research on the topic. "Research method" section presents the research methodology. In "Results" section, we provide the experiment's findings and "Discussion" section discusses the findings in terms of similarities and differences with other works. "Conclusion" section presents the conclusions. Finally, in "Suggestions for further study", section we provide suggestions for further research.

Literature review

Game-based learning

Video games have gained popularity as an influential learning tool (Kang et al., 2007; Komala & Rifai, 2021). According to Pivec (2007, p. 387),

> Digital game-based learning is a novel approach in the area of universities and lifelong learning, and the search for new positioning of the universities in the changing setting of education; gaming is becoming a new form of interactive content, worthy of exploration.

Chapelle (2007, p. 107) claims that digital technology "dramatically extends and changes the breadth and depth of exposure that learners can have with the target language," and the combination of technological devices in foreign language teaching has been significantly enhanced in recent years (Chen et al., 2016; Miangah & Nezarat, 2012). Per sociocultural conceptions, games are embedded within game-playing communities that view learning as a type of participation in social practice (Ramirez & Squire, 2015). According to Lämsä et al., (2018, p. 598), "researchers' interest increasingly has been on game-based learning and gamification of learning." Lämsä et al., (2018, p. 598) further point out that "game-based learning can also be cost-effective, here reducing the need for teacher involvement during the practice of skills."

Some researchers have pointed out the challenges involved in game-based learning (Elverdam & Aarseth, 2007; Iten & Petko, 2016), including encouraging learners to be engaged in game settings, maintaining learners' motivation. Thus, motivation is more often than not guaranteed in game-based applications. However, some game researchers (e.g., Haworth & Sedig, 2011) have cautioned that educational games can be poorly designed, and that game designers may not clearly understand the optimal design of these types of games. Johann and Karbach (2020, p. 3) observed that "training effects were larger in the game-based as compared to the standard training versions." They also posited that game-based learning brings about higher motivation levels than standard training conditions. Likewise, Johann and Karbach (2018) argued that game-based learning meets three basic psychological needs in educational settings: "[r]elatedness (feeling connected and involved with others and having a sense of belonging), autonomy (the need to experience one's behavior as self-determined), and competency (feeling effective in one's interactions with the environment)" (Johann & Karbach, 2020, p. 3). Chen et al. (2020) used the concept of 'immersion' to refer to the educational advantages of

game-based learning, comprising three successive stages: engagement, engrossment, and total immersion. Based on the immersion concept, "students who had more prior knowledge would maintain a certain degree of engagement in game-based learning and their engagement would determine their learning outcomes" (Chen et al., 2020, p. 3).

The works cited above clearly reveal that games are beneficial learning activities, where the "application of games and simulations for learning means an opportunity for learners to apply acquired knowledge and to experiment, get feedback in form of consequences and thus gain experience in a 'safe virtual world'" (Pivec, 2007, p. 390). Overall, game-based learning provides learners with many active learning practices, encouraging learning by doing and experiential learning.

The effect of interactive games on language learning

Many studies have tested interactive games' superiority over traditional instruction modes (Holden & Sykes, 2011; Hung et al., 2018; Kapp, 2012; Rohani & Pourgharib, 2013). Some studies have focused on different skills and subskills, while others have considered the subskills of grammar and vocabulary. For instance, Papadakis (2018) found out that both cooperative and competitive games significantly affect learners' vocabulary learning, their perception of the instruction, and their level of motivation. However, deciding which types of games are more effective is difficult. For instance, Aghlara and Tamjid (2011) found that the mean score of the children who learned vocabulary by playing digital games was higher than that of the control group. Kao (2020) also found that participants who learned grammar through interactive games outperformed those who learned grammar through conventional approaches.

Interactive games also have a positive effect on primary skills. In this regard, Kaur and Abdul Aziz (2020) suggested that language games have a significant positive impact on enhancing learners speaking skills. Tümen Akyıldız and Çelik (2021) used a mixed-method approach to investigate the effect of reading tasks through WhatsApp on students' reading comprehension scores. Their research showed that students who participated in the experimental group performed better than the control group in finishing the reading comprehension activities, and they linked this to students' positive attitudes toward employing WhatsApp to improve their reading skills. Erya and Pustika (2021) examined the use of Webtoons to enhance students' comprehension skills, confirming that Indonesian students' reading comprehension skills and motivation increased dramatically. Using an explanatory multimethod approach, Nurjanah (2018) argued that students face problems in developing reading comprehension skills when their learning habits are poor and the reading passages are not sufficiently interesting. Thus, Nurjanah argued that students be exposed to classroom games to keep them motivated and engaged. Hooshyar et al. (2018) employed a data-driven approach toward educational games. They found that game-based learning results in more significant performance-based gains when focused on content tailored to learners' abilities. Based on a systematic review of studies on the role of games on L1 and L2, Hanghøj et al. (2022) found that L2 studies manifest positive findings with educational games with regard to the investigated language skills (mainly on vocabulary, reading, and writing).

Many other researchers have also highlighted video games' importance in learning quality. For example, Kapp et al. (2014) stated that using games created positive memories of learning, increased learners' attention, and helped learners acquire language in an entertaining and enjoyable atmosphere. Komala and Rifai (2021) studied the influence of playing video games on participants' opinions about games. Using a self-produced video game called 'The Cherry Orchard', they identified a significant difference in the scores of the experimental group. That said, the study revealed that "[s] tudents' opinions about the game, however, were not all positive as many of them claimed that the video game was too long and monotonous" (p. 368). Likewise, Ahmed et al. (2022) conducted an experimental study using the Foreign Language Classroom Anxiety Scale and Motivation Test Battery to investigate the effect of games on Iranian EFL learners' language anxiety and motivation. The findings of their study revealed that those learners who received treatment based on game-based learning had lower anxiety levels and better performance in class. Using a video-conferencing platform called Gather. Town et al. (2022) concluded that game-based technologies provide language learners and teachers with an informal online learning environment, facilitating both teacher-fronted and student-centered self-paced learning and community building.

However, some researchers argue that video games do not play a pivotal role in language learning, or they warn us about the negative influences of technology on language learning. For instance, Rohani and Pourgharib (2013) demonstrated no significant difference between learners who learned vocabulary through games and those who used textbooks. In addition, Villanueva (2022) argued that key skills that are highly effective learning strategies, such as note-taking and summarizing, are at risk with technological advances. This is because students may become too dependent on technology and the facilities it would bring about.

Another group of scholars has clarified the role of attitude in language learning (Kendeou et al., 2016; Ma & Kishor, 1997; McLeod, 1992; Nisbet & Williams, 2009). As Kamii and Rummelsburg (2008) stated, since games stimulate logico-mathematical thinking, they have played an influential role in learning mathematics (Nisbet & Williams, 2009).

Likewise, many studies have investigated the effect of interactive games on learners' attitudes. For instance, Zheng et al. (2013) found that games establish the context for language learners to be in contact with native speakers through activities in a game-like virtual world, positively affecting their self-efficacy and attitude toward the target language (Derakhshan & Khatir, 2015). Furthermore, it has been shown that games effectively achieve educational objectives such as creative thinking, critical thinking, problem-solving, role-playing, and collaborative work in a stress-free and fun atmosphere that positively affects the learning process and learners' attitudes (Fidan & Tuncel, 2019).

Despite their potential for developing learners' language proficiency, games are marginal in the classroom because they are mostly viewed as a warm-up exercise or an extracurricular activity (Foster & Shah, 2020). As pointed out by Pivec (2007, p. 387), "[u]nfortunately, in formal education, games are still often seen just as an unserious activity, and the potentials of games for learning often stay undiscovered." Challenging this attitude toward games, Uberman (1998) stated that games should be intrinsic to classroom activities rather than having a marginal role. However, this cannot be a recipe for practice until sufficient empirical evidence supports the efficacy of using games. Unfortunately, as the literature review has revealed, the empirical evidence on the impact of interactive games is scarce and sometimes contradictory (Chiu et al., 2012).

Previous studies have dealt with the advantages of educational games for developing different skills and subskills related to language learning. However, our review of the extensive literature on educational games showed a paucity of research on educational games in the context of Iran, a setting where the role of technology and educational games is largely underestimated (Hooshyar et al., 2018). This study differs from previous research because we also examine learners' attitudes toward games in the experimental group. Guided by prior theoretical perspectives, this study hypothesizes that:

A: Teaching through interactive games significantly positively affects EFL learners' reading comprehension.
B: Teaching through interactive games significantly positively affects EFL learners' attitudes.

Research method

This study aims at establishing a cause-and-effect relationship between 'teaching through interactive games' as the independent variable and 'learners' comprehension and attitude' as the dependent variables; hence, it used randomized subjects and a pretest–posttest control group design. The research design followed in this study is quantitative, using experimental and control groups to investigate the role of the treatment.

Participants

This study was conducted in Bojnord, the capital city of Northern Khorasan, Iran. Using a cluster sampling procedure, from the total universe of language institutes in the urban areas of Bojnord, two language institutes were randomly selected: *Orooj* and *Zabansara* private language institutes. From each language institute, two classes of 20 learners (gender was equally distributed) were then randomly selected to participate in the study. In coordination with the supervisors of the language institutes, we administered a Nelson Proficiency Test, and based on the learners' performance, we assigned outliers to other classes. This procedure yielded two homogenous classes, each comprising 30 Iranian learners (15 males and 15 females) of English as a foreign language. Finally, the two classes were randomly assigned to the control and experimental conditions. The participants were aged from 18 to 22 years. The researcher selected the subjects randomly. The participants were all preintermediate learners who chose to develop their language proficiency by taking part in evening classes. All participants participated voluntarily in this study and provided informed written consent to participate.

Instrumentation

This study used three instruments. Before the study, the standard Nelson test was administered to homogenize the participants in terms of their proficiency. The second instrument was a teacher-made test used as both a pretest and a posttest. The last instrument was a questionnaire developed and validated by the researchers who conducted this study, which was administered to measure learners' attitudes toward interactive games.

The standard Nelson test 050A (Fowler & Coe, 1976) was used as a homogenizing test. Although the Nelson test is reliable, Alami et al. (2014) confirmed the reliability of this Nelson test. In line with their study, the KR-21 was applied, and the result revealed high reliability (0.73). This test incorporates different questions to assess learners' proficiency in English. This is a multiple-choice test comprising 50 questions. The items measure learners' general grammar, structure, and vocabulary knowledge. Sixty out of 80 learners who scored at least 65% on the test were selected as participants in the study.

The second instrument was a teacher-made reading comprehension test used as both pretest and posttest. The test consisted of 30 multiple-choice items. The researchers assessed learners' reading comprehension ability. A

Cronbach's of 0.69 indicated the test was reliable. Since the content of the test reflected the content of a specific textbook, syllabus-based validity was assured by experienced language teachers who verified the correspondence between the test items and the items in the selected textbooks.

The last instrument was a questionnaire to reveal learners' attitudes toward interactive games. The questionnaire had 18 items and was designed in the learners' mother tongue. The questionnaire inquired about the learners' opinions of the games' advantages and disadvantages, including the effects of the games on their reading comprehension, level of motivation and interest, among other topics. The questions were in multiple-choice format. It was piloted on a group of 35 participants to determine the questionnaire's psychometric properties. The reliability of the test was obtained through Cronbach's Alpha with a score of 0.85. In addition, two independent experts assured the validity of the content.

In the experimental group, the interactive free Android game 'Murder in the Alps' was used to provide the participants with the reading content. It is a well-designed crime adventure. Adventure games appeal to players' intrinsic motivation to examine the game world. Intrinsically motivating games present rich content that offers various learning activities. To increase players' immersion, the game offers thrilling chapters full of riddles, often related to some murder or mystery. The game's main character, Anna Myers (a young journalist from Zürich who tends to find herself solving various murder mysteries), has to solve mysteries by finding hidden objects and following interactions to track down the murderer in different scenarios. In each case, the problems are part of the game, and players are motivated to seek hidden objects and read the instructions to finish each chapter. Enjoyment in the game is strongly related to the learning activity (decoding the interactions and knowing what each hidden object means so that the player can find it), with unique gameplay features. Players must read built-in strategy guides to follow every step of the game. In, Figs. 1, 2, 3 we have revealed some photos from the game setting:

This interactive game contains challenging and inviting features that allow participants to practice their lexical retrieval (to understand the meaning of the words through finding hidden objects) and decoding skills (to make sense of the content), both at the word and sentence levels. The words and phrases are regularly repeated to improve lexical retrieval and comprehension, making the game highly suitable for learning. 'Murder in the Alps' is designed to enhance lexical retrieval and decoding skills. The game improves lexical retrieval by linking words with relevant objects.[2] This game is aligned with the aim and scope of the study, which focuses on basic reading skills, including decoding and text reading (Cromley & Azevedo, 2007).

Fig. 1 The main character, Anna Myers (at the center), and other characters in the game

Fig. 2 Anna is interacting with Walter (the man who is opening the door)

'Murder in the Alps' is an applied game. This game category incorporates high motivational appeal that facilitates language learning (Connolly et al., 2012; van de Ven et al., 2017). The theory behind adopting applied games is to encourage full concentration and heighten enjoyment,[3] highlighting the influence of the 'flow zone.' Players in the flow zone are encouraged to play, in line with the valuable

[2] Elleman and Oslund (2019, p. 8) argue that "[a]n early and sustained focus on developing background knowledge, vocabulary, inference, and comprehension monitoring skills is necessary to improve reading comprehension across grade levels.".

[3] The literature has provided evidence for the detrimental effects of anxiety on learning, especially reading comprehension (Namaziandost et al., 2022).

Fig. 3 Anna is interacting with the policeman

components of the games. Games enhance intrinsic motivation (Deci & Ryan, 2008), and, depending on the level of difficulty, are challenging and engaging (Vygotsky, 1978) and provide in-game rewards. All these features improve the interaction between the players and the game world.

Procedure

This quantitative study uses inferential statistics based on assumptions about the distribution of the population from which the sample was taken. In this study, the effect of interactive games on EFL learners' reading comprehension and attitude was investigated step-wise. First, before the experimental intervention, the Nelson standard test was distributed to assure the homogeneity of the sample in terms of proficiency. As a second step, a teacher-made reading comprehension test found to have an acceptable level of reliability and validity was administered as the pretest. As expected, because participants were randomly assigned to the two test conditions, the pretest results indicated no significant difference between the participants in the control and experimental conditions.

Having accounted for any possible initial differences between the participants in the two groups, we initiated the experimental phase of the study. The participants in the experimental group were played an interactive Android game, 'Murder in the Alps' (see "Instrumentation" section for further details). The intervention phases consisted of 12 sessions of 40 min, during which the learners played the game. In each session, all learners in the experimental group completed different episodes of the game, depending on the learners' reading and retrieval abilities. All sessions took place at the institute under the supervision of a trained educator who was available to answer questions and ensure that the learners were not distracted from the game.

Conversely, the participants in the control group were instructed through the conventional reading comprehension method. Both groups participated in a three-hour per week reading instruction that lasted 4 months. After the experimental intervention, the same reading comprehension test was used as the posttest to measure the effect of the interactive games on learners' reading comprehension and attitude. Finally, an independent-samples t-test was used to see whether the difference between sample statistics was significant. The independent-samples t-test analyzes the mean comparison of two independent groups. The independent-samples t-test requires the assumption of *homogeneity of variance,* i.e., both groups have the same variance. A paired-samples t-test was also performed to compare the difference in performance between the pretest and posttest for the control and experimental groups (to determine whether the mean difference between two sets of observations was zero).

Results

This study explored the effect of interactive games on EFL learners' reading comprehension. As a secondary objective, it also probed the effect of interactive games on learners' attitudes. Finally, the study tested the following null hypotheses:

H_0 1: Interactive games do not significantly affect learners' reading comprehension.
H_0 2: Interactive games do not significantly affect learners' attitudes.

The independent-samples t-test was employed to ensure that the participants were homogenous before the implementation of the treatment.

As Table 1 shows, there is not any statistically significant difference ($df = 58$, $t = 0.47$, $p = 0.63 > 0.05$) between control ($N = 30$, $M = 37.40$, $SD = 3.28$) and experimental ($N = 30$, $M = 37.83$, $SD = 3.73$) groups in Nelson proficiency test, confirming the homogeneity of the participants at the beginning of the study.

Table 1 Results of independent-samples t-test for homogenizing test

Group	N	M	SD	Df	t	Sig. (two-tailed)
Control	30	37.40	3.28	58	0.47	0.63
Experimental	30	37.83	3.73			

Table 2 Results of independent-samples t-test for pretest

Group	N	M	SD	Df	t	Sig. (two-tailed)
Control	30	8.50	2.67	58	0.42	0.67
Experimental	30	8.80	2.83			

Table 3 Results of independent-samples t-test for posttest

Group	N	M	SD	Df	T	Sig. (two-tailed)
Control	30	16.80	3.71	58	11.20	0.000
Experimental	30	26.33	2.80			

Table 4 Results of paired-samples t-test for the control group

Pair	N	M	SD	Df	T	Sig. (two-tailed)
Pretest	30	8.50	2.67	29	10.19	0.000
Posttest	30	16.80	3.71			

Table 5 Results of the paired-samples t-test for the experimental group

Pair	N	M	SD	Df	T	Sig. (two-tailed)
Pretest	30	8.80	2.83	29	33.99	0.000
Posttest	30	26.33	2.80			

Moreover, as shown in Table 2, there was not any statistically significant difference (df = 58, $t = 0.42$, $p = 0.67 > 0.05$) between control ($N = 30$, $M = 8.50$, SD = 2.67) and experimental ($N = 30$, $M = 8.80$, SD = 2.83) groups in the pretest. Data in Table 2 indicate the participants' homogeneity.

The independent-samples t-test was used to determine whether the first null hypothesis was verified or rejected. As shown in Table 3, participants in the experimental group ($N = 30$, $M = 26.33$, SD = 2.80) significantly (df = 58, $t = 11.20$, sig = $0.000 < 0.05$) outperformed those in control one ($N = 30$, $M = 16.80$, SD = 3.71) in the posttest. Therefore, the first null hypothesis was rejected in favor of the research hypothesis. In other words, the results indicate that interactive games significantly positively affect learners' reading comprehension. Although the analysis revealed a significant difference in reading comprehension between the two groups, we used a paired-samples t-test to see whether learners' comprehension gains were significant.

As shown in Table 4, participants in the control group ($N = 30$) gained a significantly (df = 29, $t = 10.19$, sig = $0.000 < 0.05$) higher mean in the posttest ($M = 16.80$) compared to the pretest ($M = 8.50$). Therefore, a second paired-samples t-test was performed to compare the pretest and posttest in the experimental group.

As shown in Table 5, just like the participants in the control group, the participants in the experimental group ($N = 30$) gained a significantly (df = 29, $t = 33.99$, sig = $0.000 < 0.05$) higher mean in the posttest ($M = 26.33$) compared to the pretest ($M = 8.80$).

Table 6 Descriptive statistics related to learners' attitudes toward games

	N	Mean	Std. deviation	Std. error mean
Attitudes test	29	4.0536	0.52463	0.09742

As a second objective, this study explored EFL learners' attitudes toward interactive games by testing the null hypothesis: H_0: Teaching reading through interactive games does not significantly affect attitudes. Table 6 shows the descriptive statistics related to the learners' attitudes toward the game. As shown in Table 6, the experimental group's mean is 4.05 (SD = 0.52).

One sample t-test was performed to test the significance of the observed sample statistics. As shown in Table 7, the mean difference is 1.05, which is statistically significant ($T = 10.815$, df = 28, sig. (Two-tailed) = 0.000).

Since the lower and the upper limits are both positive, the sample's mean is higher than the test value (3.0). Accordingly, the second null hypothesis, 'Employing interactive games does not significantly affect L2 learners' attitudes toward games' was also rejected. Thus, we conclude that using interactive games in teaching reading comprehension significantly positively affects learners' attitudes.

Table 7 Results of attitudes test

Attitudes test	Test value = 3					
	T	Df	Sig. (Two-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
	10.815	28	0.000	1.05364	0.8541	1.2532

Discussion

This study differs from similar studies in that we examined games from two perspectives: how games can improve learners' reading skills and how they influence attitudes toward games. This is important because some researchers (e.g., Komala & Rifai, 2021) argue that although language games improve language learning, students (or even teachers) may not have a positive attitude toward using games in class.

To achieve the objectives of the study, two null hypotheses were formulated. The first null hypothesis was rejected. Therefore, it can be logically concluded that interactive games significantly positively affect learners' reading comprehension. The second null hypothesis was also rejected in favor of the research hypothesis stating that the use of interactive games significantly positively impacts learners' attitudes. In conclusion, learning English by playing games is an efficacious and intriguing learning method that can be adopted in any class. Furthermore, this research suggests that interactive games are employed not just for fun but, more importantly, for achieving greater engagement in learning. As a result, games help improve learners' reading comprehension skills.

The results of this study show that the use of interactive games significantly affects EFL learners' reading comprehension and attitudes. The findings of this study lend support to Yolageldili and Arican (2011), who argued that learning is more effective when learners cooperate and interact in a fun atmosphere. The findings also support Kapp et al.'s (2014) study by showing that using games contributed to meaningful learning, increased learners' attention, and helped learners acquire language skills in an entertaining and enjoyable way. Our study also showed that video games improve learners' motivation and attitude to learn content meaningfully. Video games are useful sources that can improve learners' motivation and language proficiency and meet teachers' goal of keeping learners thinking in English.

Games are powerful educational technology, which can help learners reach the necessary threshold and subsequently help improve decoding the words and reading fluency. Other research studies also support this. In this regard, Ecalle et al. (2021) argue that meaning is better communicated when a certain threshold is obtained during passage reading. Moreover, encouraging learners to read is crucial in improving their reading comprehension skills (Namaziandost et al., 2022). The findings of this study revealed that learners' attitudes toward games increased after the experiment. This, in turn, can encourage learners to be more engaged in reading by reducing anxiety and stress on the part of the learners. Video games can provide authentic input that can improve learning experiences. This is in accord with Namaziandost et al.'s (2022) study, which suggested that authentic materials can enhance learners' reading motivation and reading comprehension ability.

In line with Vygotsky's concept of social constructivism (Vygotsky, 1978), the zone of proximal development, successful games (such as the one that we resorted to in this study) gradually enhance the difficulty level and ask the players to read different sentences and scenarios, as they obtain the necessary skills to continue to the next levels. Therefore, as supported by our study and other similar works (Salen & Zimmerman, 2003), learners engage with content with a positive attitude. Therefore, games as a challenging instrument maintain learners' engagement in the content and keep learners motivated (both intrinsic and extrinsic).

This study also highlights the importance of independent learning through video games. Elleman and Oslund (2019) argue that enhancing previous knowledge and vocabulary is not so influential in improving reading comprehension. Instead, students should be encouraged to become strategic readers who can independently learn from text. This study shows that learners are so willing to play video games in class, which can consequently improve their autonomous learning and self-confidence. That said, as mentioned by Komala and Rifai (2021), to be effective, video games should be kept short and embrace users' sense of accomplishment to keep them engaged. Following Barber and Klauda's (2020) study, the findings of this study indicated that teachers need to learn the principles and tools of reading motivation and engagement. We revealed that video games can significantly increase reading skills and attitudes. Therefore, we suggest that video games should be given more attention since they have been proven to be promising tools to foster learning and interaction inside and outside the classroom.

Conclusion

The findings of this study revealed that if the learners are engaged in the learning process (e.g., through exposure to video games), their language proficiency will be improved significantly. In doing so, the learners not only improve their sense of curiosity, but also their reading skills, problem-solving skills and confidence, the effectiveness of which stretches back to the classroom and beyond. This study found a clear connection between learner motivation and learning outcomes in the context of language learning. The findings of this study also implied that engaged learners are active and interested, and, more often than not, do better than those uninterested in the content they wish to learn. Therefore, video games are very good at fostering an interactive atmosphere that motivates students to learn. Video games can provide language teachers and learners with an engaging and informal online learning environment, facilitating both student-centered and teacher-fronted learning and community formation. Games encourage teachers and learners to go beyond information presented in textbooks, create new ideas, improve and enhance social competencies, and build the foundations for automatic learning. They allow for increasing involvement of students. They help overcome significant deficits and challenges of traditional teaching methods (Sheldon, 2012). The creation of computer technologies frequently allows for wider use of teaching video games. Therefore, games have a high potential to increase content knowledge by letting the students *live* the educational scenarios. The scaffolding provided by games and their customizable environment enables teachers to create a social context and give the learners role-play scenarios to practice different skills inside and outside the classroom.

Suggestions for further study

As a further study, we suggest that interested researchers conduct interviews to explore the participants' feelings and experiences. Overall, based on the current experimental study, the following suggestions are proposed. First, the effect of interactive games on other language skills and components and other proficiency levels should be investigated in more depth. Second, researchers are encouraged to investigate the role of games on language assessment as well. Currently, this area is underdeveloped in the field. Finally, there is a lack of research on the effect of games on improving learners' pragmatic competence.

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Declarations

Conflict of interest The author declares there is no conflict of interest.

Ethical approval Informed consent was obtained from all participants before the study began. Participation in this study was completely voluntary.

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