

Audio-Based Shadowing Technology for Learning English Collocations: A Gateway to AI-Driven Language Pedagogy

Neda Soleiman Rad¹, Mohammad Reza Khodadust^{2*}, Azin Khodadoust³

¹ Department of English Language Teaching, Faculty of Humanities, Payame Noor University, Tabriz, Iran

² Department of English Language Teaching, Farhangian University, P.O. Box 14665-889, Tehran, Iran

³ Department of English Language, Electronic Branch, Islamic Azad University, Tehran, Iran

* Corresponding author email address: m.khodadoust@cfu.ac.ir

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ABSTRACT

In the evolving landscape of technology-enhanced language learning (TELL), this study investigates the efficacy of a technology-mediated shadowing technique on the acquisition of English collocations among Iranian EFL learners. A sample of 80 intermediate learners was selected and randomly assigned to experimental and control groups. Initially, a pre-test was administered to assess the learners' prior knowledge of collocations. The experimental group used audio-shadowing technology, while the control group received equivalent instruction through explicit explanation and text-based practice. Following ten 90-minute instructional sessions, participants completed a post-test to evaluate their knowledge gains. A researcher-developed multiple-choice test containing 40 items served as both the pre- and post-test of the study. Paired and independent samples t-tests were performed to answer the research questions. Findings indicated that this simple technological intervention significantly enhances collocational understanding for both male and female learners, with no notable gender differences identified. These results provide valuable insights for educators and curriculum developers seeking to integrate low-threshold technologies into the classroom, and highlight the potential of scalable, audio-based methods as a foundational step towards more sophisticated technology-powered personalized listening and vocabulary acquisition tools.

Keywords: *Shadow listening, English collocations, EFL, technology-enhanced language learning*

1. Introduction

Language learning is a multifaceted process that demands mastery of the four principal skills: listening, speaking, reading, and writing. Among these, listening often emerges as the most crucial skill, as many learners encounter significant challenges in its acquisition and application (Hamada, 2015; Moray, 1959; Yoon, 2021). Effective listening is paramount for comprehension and interaction, making it a primary focus in both teaching and learning contexts (Agustinus et al., 2019; Hamada, 2016). Despite the emphasis on this skill, EFL learners frequently

struggle with understanding spoken language, particularly the use of collocations—combinations of words that frequently appear together in natural speech (Ding & Reynolds, 2019; Khan & Liu, 2020). This difficulty can impede their ability to communicate effectively, highlighting the need for innovative teaching strategies that enhance learners' listening and collocation knowledge. In the digital age, the integration of technology-enhanced listening tools has become paramount in addressing these challenges and providing learners with authentic, accessible, and repetitive input.

One technological strategy gaining traction is audio shadowing, a technique facilitated by playback software that allows learners to repeat spoken language in real time while simultaneously processing it cognitively (Hamada, 2014). Shadowing can significantly bolster listening skills by promoting active engagement with the language being learned (Ekayati, 2020; Ghalavandi, 2019). Moreover, understanding English collocations is essential for EFL learners, as it aids in achieving both fluency and coherence in communication (Biel et al., 2018; Choi, 2017). Although much research has been conducted on collocations in various contexts, there remains a notable gap concerning their learning in the Iranian EFL setting, revealing a need for focused investigation into effective pedagogical approaches and the influences of different learning styles.

This study aims to explore whether shadowing can enhance the knowledge of English collocations among Iranian EFL learners in face-to-face classroom settings. By implementing this strategy, the research investigates its efficacy in improving collocation understanding and identifies possible differences in the learning outcomes between male and female learners. Given the persistent challenges faced by EFL learners in mastering collocations, the significance of this study lies in its potential to inform educators and curriculum developers about successful methods for fostering language proficiency. Additionally, it underscores the importance of auditory and visual learning styles, which may better engage learners and enhance their overall language acquisition processes. While research on AI and complex learning platforms is burgeoning, there is a significant gap in understanding how simple, low-cost audio technologies can be effectively leveraged to teach specific linguistic features like collocations, particularly in contexts with limited technological resources.

Moreover, while previous research on shadowing has often included mixed-gender samples and reported overall efficacy, few studies have explicitly and systematically examined whether gender influences the effectiveness of shadowing for acquiring specific linguistic features such as collocations. Furthermore, no study to date has investigated gender differences within the context of a *'technology-mediated audio-shadowing'* intervention designed explicitly for collocation learning. Therefore, this study aims not only to explore the efficacy of this simple technological intervention but also to provide a focused, empirical examination of potential gender-based differences in learning outcomes—a nuanced inquiry that

extends beyond the general efficacy reported in prior shadowing literature.

The findings from this study will not only contribute to the current literature on collocation learning and shadowing but also provide practical insights for EFL instructors seeking to address identified gaps in learners' skills. Furthermore, the research aims to highlight the necessity of adapting teaching methodologies to accommodate varying learning styles, ultimately invigorating learner engagement and improving educational outcomes. This study addresses this gap by examining a scalable technological intervention that can inform the design of future, more intelligent systems.

While existing studies have demonstrated the efficacy of shadowing for listening skills (e.g., (Hamada, 2015; Lestari, 2023)) and the importance of collocation instruction (e.g., (Ghonsooli et al., 2008; Rahimi & Momeni, 2012)), these lines of inquiry have largely remained separate. Research investigating *'technology-mediated shadowing'* has focused on general listening proficiency or accent adaptation (e.g., (Hamada & Suzuki, 2021; Yoon, 2021)), not on the acquisition of specific lexical-grammatical features like collocations. Conversely, studies on collocation learning have rarely employed shadowing as the primary pedagogical tool, especially within a simple, low-cost digital audio framework. Therefore, the present study establishes a clear boundary with prior work by integrating these two strands: it applies a focused, replicable audio-shadowing intervention—using basic digital playback software—explicitly to teach verb-noun collocations, while also systematically testing for gender differences in learning outcomes—a variable often mentioned but seldom isolated in similar interventions. This delineates our research from prior shadowing or collocation studies and defines its unique contribution: examining the intersection of a specific technology, a specific technique, a specific linguistic feature, and a specific learner variable in a defined EFL context. This study compares the efficacy of technology-mediated shadowing against a conventional, explicit instruction approach for teaching collocations, while also examining potential gender differences. In this line, the following research questions were posed:

- 1) Does shadow listening affect Iranian male EFL learners' knowledge of collocations significantly?
- 2) Does shadow listening affect Iranian female EFL learners' knowledge of collocations significantly?

3) Is there any significant difference in the effect of shadow listening on English collocations' knowledge of male and female EFL learners?

2. Theoretical Framework: Cognitive-Affective Theory of Learning with Media and its Implications for Shadowing Technology

The present study is grounded in the Cognitive-Affective Theory of Learning with Media (CATLM) proposed by Moreno (2005); Moreno and Mayer (2007) and its extensions. This theory provides a robust lens for understanding why and how technology-mediated shadowing can be an effective pedagogical tool for acquiring complex linguistic constructs like collocations.

The CATLM posits that effective learning with media occurs when the technology's design supports five key cognitive and affective processes:

Managing Essential Processing: Breaking down complex information.

Fostering Generative Processing: Encouraging deep mental engagement.

Offering Feedback: Providing corrective information.

Moderating Motivation: Influencing the learner's willingness to engage.

Regulating Affect: Managing the learner's emotional state.

Audio shadowing technology directly supports these processes in the context of collocation acquisition, as illustrated in Figure 1:

Figure 1

A Cognitive-Affective Theory of Learning with Media (CATLM) model illustrating how audio-shadowing technology facilitates collocation acquisition by guiding cognitive processes and influencing affective factors

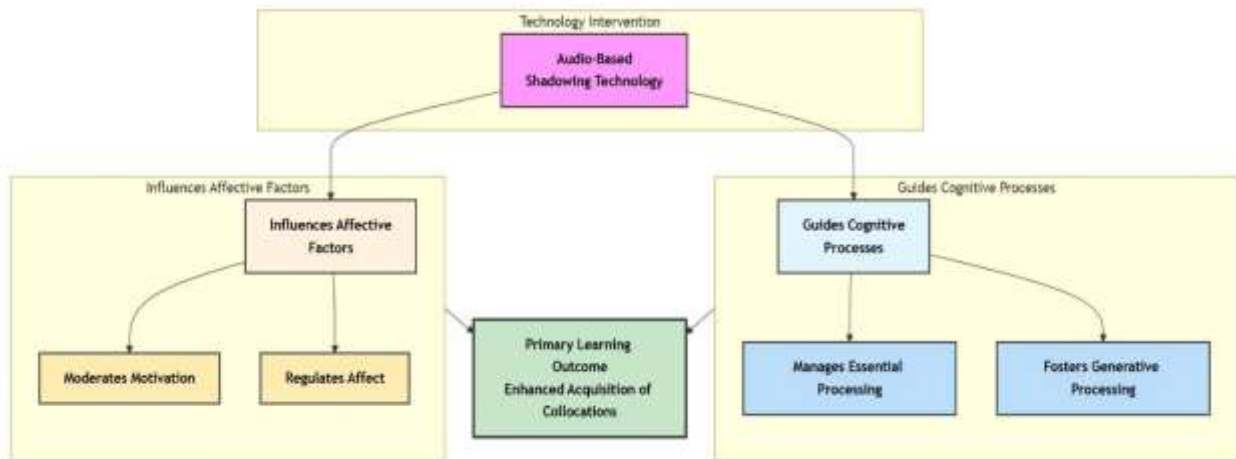


Figure 1 illustrates how audio-shadowing technology facilitates collocation acquisition by guiding cognitive processes and influencing affective factors:

Managing Essential Processing (Cognitive Load): Collocations are challenging because they represent multi-word units that overload working memory if processed word-by-word. Shadowing technology, by presenting collocations as unified "chunks" through paced audio, manages essential processing. It directs the learner's attention to these chunks (e.g., "pay a visit" instead of "pay," "a," "visit"), reducing cognitive load and facilitating storage in long-term memory as single units.

Fostering Generative Processing (Deep Engagement): The CATLM emphasizes that learning is

deeper when students engage in generative processing—actively making sense of the material. Shadowing is not passive listening; it is a generative process. The requirement to listen and simultaneously articulate the collocation forces learners to actively construct a connection between the phonological form, orthographic form (text), and the meaning of the chunk. This multi-modal engagement leads to richer mental models and better retention, directly addressing the "notable gap" in effective pedagogical approaches for collocations.

Moderating Motivation & Regulating Affect (The Affective Dimension): Language learning anxiety is a significant barrier. The CATLM integrates the crucial role of affect. The technology-mediated, self-paced nature of

shadowing creates a low-stakes environment. Learners can practice repeatedly without the social pressure of a live classroom, which moderates motivation by boosting self-efficacy and regulates affect by reducing anxiety. This supportive environment encourages risk-taking and sustained engagement with the difficult material.

3. Review of literature

3.1. Shadowing

Shadowing was initially adopted as a training method for interpreters, but it has only recently garnered the interest of language educators and been integrated as a listening exercise in foreign language instruction (Hamada, 2012). Numerous definitions of the shadowing technique have emerged. For instance, Lambert (1992, as cited in (Hamada, 2012)) characterizes shadowing as a “paced, parrot-style auditory tracking task, conducted with headphones” (p. 4). Similarly, Tamai (1997) posits that shadowing should not be regarded as a passive endeavor; rather, it is an active and cognitively demanding listening activity whereby learners actively trace the spoken language and articulate it as distinctly as possible while concurrently listening. This process of repeating incoming auditory inputs while monitoring the corresponding material is believed to stimulate multiple regions of the learner's brain, notably the language processing centers (Kadota, 2007).

Furthermore, Shiki et al. (2010) draw a distinction between shadowing and simple repetition exercises. They argue that shadowing offers greater benefits to language learners compared to mere repetition, as shadowing involves an immediate, contextualized reproduction of speech, whereas repetition acts as an off-line task that allows learners to take silent pauses to replicate the sounds. Shadowing is a technique primarily rooted in second language acquisition and cognitive psychology, defined as the process where individuals listen to a target language audio and simultaneously repeat the heard content, either audibly or silently (Yavari & Shafiee, 2019). This dual task incorporates immediate listening and speech production, which promotes deeper cognitive engagement with the material (Hamada, 2015). The practice of shadowing serves not only as an effective method for language learning but is also grounded in theories of cognitive processing, including the notions of working memory, attentional control, and phonetic imitation (Kadota, 2007).

3.2. Collocations

Comprehending vocabulary extends beyond merely grasping the isolated meaning of a word. It is essential for learners to understand the relationships between words, a concept referred to as collocational knowledge (Rahimi & Momeni, 2012). Lei and Liu (2018) argue that collocations serve as a fundamental aspect of vocabulary. O'Dell and McCarthy (2008) describe collocations as lexical bundles that frequently occur together more than would be anticipated by chance, functioning akin to a grammatical union of words. The concept of collocation is based on the observable phenomenon that certain words co-occur in natural text with greater than random frequency (Lewis, 1997). Additionally, Grabe and Stoller (2002) contend that “L2 learners often read materials with glosses for more difficult terms” (p. 58).

Thus, it can be posited that collocations involve the co-occurrence of words from various lexical categories (e.g., verbs, nouns, adjectives, and prepositions) in the natural flow of communication (Poulsen, 2022). In an early attempt to systematically categorize English collocations, Benson et al. (1986) distinguished between grammatical and lexical collocations. This classification indicates that grammatical collocations include 19 structural types characterized by a core content word accompanied by a function word, whereas lexical collocations consist solely of content words, devoid of any function words. In the present study, the researchers focused on verb-noun collocations (e.g., make a call).

Research indicates that the acquisition of collocations is a crucial element in the process of learning a new language, making the emphasis on collocation instruction within language classrooms highly beneficial for second language learners (Arifani, 2019; Attar & Allami, 2013; Fanaee, 2014). In particular, instruction on collocations is deemed especially important in foreign language learning environments where learners have limited opportunities to engage with the natural use of language outside the classroom. As a result, it becomes essential for educators to incorporate more authentic aspects of the target language into the learning curriculum (Jeensuk & Sukying, 2021).

Moreover, an equally significant concern is that collocations are widely regarded as one of the more challenging areas in language acquisition. Scholars such as Taiwo (2004) contend that translating collocations literally from one language to another may result in inappropriate combinations (for instance, "tall people" instead of "high

people"). Laufer (2011) emphasizes that both oral communication and written assignments of L2 learners, even those at advanced proficiency levels, reveal a deficiency in collocational knowledge. Additionally, the increased flexibility of lexical collocations in contrast to grammatical collocations has created greater opportunities for word combinations, which can consequently lead to collocational errors. This situation has prompted researchers to explore effective and systematic approaches to teaching and incorporating lexical collocations into language curricula.

The present study investigates the effect of shadowing techniques on the understanding and use of English collocations among language learners. Research supports the efficacy of shadowing for enhancing listening and speaking skills. It has been posited that shadowing requires learners to actively engage with the linguistic input, thereby improving phonetic and prosodic features in their speech (Puspita et al., 2016). Moreover, the technique has been shown to enhance working memory, as learners must hold auditory information long enough to articulate it, engaging various cognitive processes (Kadota, 2007). This aligns with findings from Meltzoff (2011), who highlighted the significance of imitation and phonetic imitation in language acquisition and social communication.

On the other hand, collocations are critical for achieving fluency and naturalness in a second language. Teaching collocations has been shown to significantly enhance reading and listening comprehension among language learners (Hsu, 2005; Lien, 2003). Understanding collocations improves vocabulary retention and facilitates higher proficiency in language use, as learners develop a natural feel for word combinations, reducing the potential for awkward phrasing (Hsu, 2010). Given this foundational link between shadowing and collocation mastery, examining how shadowing techniques influence collocation acquisition is pertinent.

3.3. Experimental Studies

Several empirical studies have investigated the impact of shadowing on various aspects of language proficiency, underscoring its benefits in listening comprehension and oral skills development. For instance, Lestari (2023) utilized a classroom action research design to demonstrate enhanced listening abilities among university students through the implementation of shadowing techniques. The findings revealed a significant increase in students' mean

scores from 58.43 to 79.45, indicating substantial improvement in their listening comprehension capabilities as a result of the shadowing practice.

Hikmat and Hasan (2022) further confirmed the positive effects of shadowing in a study involving simultaneous interpretation skills among university students. The use of shadowing not only advanced students' abilities in this complex cognitive task but also showed no significant gender differences in post-test performance, implying that the technique benefits all learners equally. Such findings highlight the versatility of shadowing as a pedagogical tool adaptable across diverse contexts.

Another pivotal study by Ekayati (2020) employed an experimental design to evaluate the influence of shadowing on listening and word recognition skills in eighth-grade students. The results indicated a significant effect of shadowing on students' word recognition abilities, affirming that active engagement through shadowing tasks fosters a deeper understanding of auditory input. This aligns with earlier findings by Brown (2014), who emphasized imitation's important role in language learning, suggesting that shadowing transcends basic echoing to foster meaningful interaction with the language being learned.

Al Kayed et al. (2022) investigated the impact of shadow-reading on the enhancement of reading comprehension among undergraduate students studying English at Ajloun University College, part of Al-Balqa Applied University. A random sample of 100 English as a Foreign Language (EFL) learners enrolled in the reading course during the first semester of the academic year 2021/2022 was selected, comprising first and second-year students aged between 18 and 22. The participants were divided into two equal groups: an experimental group, which received instruction through shadow-reading, and a control group, which experienced only standard classroom reading instruction. To assess the effectiveness of the interventions, a posttest was administered to determine whether significant differences existed between the two groups. The findings revealed that shadow-reading had a positive effect on reading comprehension, demonstrating its superior efficacy compared to traditional methods of instruction.

Hamada and Suzuki (2021) sought to introduce a pedagogical approach that incorporates shadowing techniques for the purpose of developing students' ability to understand unfamiliar English accents. The study involved 96 Japanese university students, who were divided

into three groups: one group engaged in shadowing with script support, another focus solely on shadowing, and a control group that solely listened without any shadowing practice. The research utilized five speech samples, each presented in a distinct English accent. To assess the participants' progress, a 75-item dictation examination—comprising 25 items each from Chinese, Italian, and American accents—was administered both prior to and following the intervention. The findings indicated that while shadowing practice alone may not effectively facilitate perceptual adaptation, the integration of a script significantly improves students' ability to adapt perceptually.

Crucially, from a technological perspective, [Yoon \(2021\)](#) developed a Computer-Assisted Shadowing Trainer (CAST), demonstrating the viability and effectiveness of digitizing shadowing practice. Their work bridges the gap between traditional shadowing and modern technology-enhanced language learning (TELL), providing a clear precedent for the type of intervention explored in the present study. Our research builds upon this by applying a similar technological principle to the specific domain of collocation acquisition.

[Movahed \(2014\)](#) conducted a study to examine the impact of metacognitive strategy instruction on the listening performance, metacognitive awareness, and listening anxiety of beginner EFL students. The sample consisted of 65 Iranian EFL learners, both male and female, enrolled in English translation and teaching programs at the University of Zabol, Iran. After administering the TOEFL listening section as a pre-test, 55 participants were selected and randomly assigned to either the experimental group ($n=30$) or the control group ($n=25$). In addition to the TOEFL listening section, the experimental group completed the Metacognitive Awareness Listening Questionnaire (MALQ), which was adapted from Vandergrift, Goh, Mareschal, and Tafaghodtari (2006), as well as the Foreign Language Listening Anxiety Scale (FLLAS). Following an 8-session instructional period based on the strategy model by [Vandergrift and Tafaghodtari \(2010\)](#), the listening performance of both groups was evaluated using the TOEFL listening section as a post-test. Furthermore, the MALQ and FLLAS were administered to the experimental group after the treatment to assess the intervention's effectiveness. The findings indicated that the experimental group significantly outperformed the control group on the post-tests, confirming the positive effects of metacognitive strategy

instruction on students' listening performance, metacognitive awareness, and listening anxiety.

The relationship between collocations and shadowing has not been adequately supported by contemporary studies. By and large, research findings demonstrate the efficacy of collocation instruction in enhancing vocabulary retention and comprehension skills. Research conducted by [Ghonsooli et al. \(2008\)](#) revealed that explicit instruction in collocations enhances writing performance significantly. Additionally, the findings of [Rahimi and Momeni \(2012\)](#) indicated that learners exposed to teaching collocations outperformed their peers, reinforcing the notion that integrating collocation instruction within language learning frameworks leads to greater overall proficiency. While the existing literature robustly supports the individual benefits of shadowing for listening skills and collocation instruction for vocabulary, the direct link between a *technology-mediated shadowing* intervention and collocation acquisition remains underexplored.

The mentioned studies illuminate the tentative relationship between shadowing and collocation acquisition. The active listening and production demands of shadowing may facilitate deeper comprehension and retention of collocational patterns, ultimately leading to improved language proficiency. As collocations require learners to recognize and internalize word combinations, the use of shadowing could enhance learners' exposure and practice, providing a dual benefit of improving both listening skills and the mastery of collocations. Given the scarcity of research studies exploring the effect of shadowing on acquisition of English collocation, the present study is an attempt to bridge this gap.

The reviewed literature confirms the independent value of shadowing for listening and of explicit collocation instruction. However, a synthesis reveals a distinct gap: no prior study has exclusively combined a '*simple, technology-mediated audio-shadowing protocol*' with the '*targeted teaching of English collocations*', while also '*investigating gender as a potential moderating variable*' in a controlled experimental design. Studies such as [Yoon \(2021\)](#) focused on technological systems for general shadowing practice, not collocation mastery. Meanwhile, collocation studies (e.g., [Arifani, 2019](#)) have employed other technological tools (e.g., WhatsApp, flipped models) but not shadowing. Our research, therefore, operates at this conceptual and methodological intersection, setting a clear boundary: it is not merely another shadowing study, nor another collocation study, but a dedicated investigation into

whether a defined, low-threshold shadowing technology can effectively teach collocations and whether this effect is uniform across genders—a question previously unaddressed in this specific configuration.

4. Methods and Materials

4.1. Participants

The participants in this study were selected from an English language institute in Hamedan, Iran, comprising 80 learners aged between 14 and 30 who were studying English for general purposes. This age range reflects the typical student demographic of the language institute, which caters to both high-school students and adult learners. To ensure that age did not confound the results, we statistically controlled for age in our preliminary analyses (see below), and all participants were homogeneous in terms of English proficiency level (intermediate), as determined by the Nelson Proficiency Test. These learners were chosen from a larger population of 300 EFL students using a convenience non-probability sampling method. To ensure a homogeneous sample, all participants took the Nelson Proficiency Test (NPT), which assessed their English proficiency levels. Based on their scores, the participants were randomly assigned to four groups: two experimental groups (male, $n=20$; female, $n=20$) and two control groups (male, $n=20$; female, $n=20$). Participants were selected via convenience sampling from an available pool of learners at the institute. While this limits broader generalizability, it ensured access to a controlled, intermediate-level sample suitable for the experimental design.

4.2. Instruments and Materials

4.2.1. Nelson Proficiency Test (NPT)

The Nelson Proficiency Test, recognized for its emphasis on vocabulary development, grammar, and reading comprehension, was employed to ensure the homogeneity of the participants regarding their proficiency levels. The test, which consists of 50 multiple-choice items, has been validated and deemed reliable in previous research (Shahivand & Pazhakh, 2012).

4.2.2. Collocation Pre- and Post-tests

A multiple-choice test comprising 40 items was developed by the researchers to assess participants'

knowledge of collocations. This test was administered as both a pre-test and a post-test, allowing for the measurement of changes in collocation knowledge over the course of the study. The items were selected from 'English Collocations in Use', and the test was designed to control for practice effects by administering it with a one-month interval. The correct answers were verified against the source material and standard corpus-based references to ensure authenticity. The reliability of the test was established using the KR-21 formula, yielding a reliability index of 0.87, and its content validity was confirmed by three experienced educators in the field.

4.2.3. English Collocations in Use

'English Collocations in Use' served as the primary resource for the research groups. This book provides a comprehensive exploration of various collocations, helping learners avoid common errors and improve their overall language proficiency (McCarthy & O'Dell, 2005). Its focus on practical usage for intermediate-level learners (B1 to B2) facilitates both self-study and classroom activities.

4.3. Procedure

This quasi-experimental study commenced with the administration of the NPT to determine the proficiency levels of the learners. Participants scoring within one standard deviation above and below the mean were selected for the study. They were, then, randomly divided into four groups: two control groups and two experimental groups, one for males and one for females.

Following the initial grouping, a collocation pre-test was administered to all participants. The results indicated which collocations were unfamiliar to the learners, as those collocations that were correctly identified by less than 10% of participants were selected for instruction. This approach ensured that the collocations taught were indeed novel to the participants.

The treatment phase lasted for 10 class sessions, each lasting 90 minutes, and began one week after the pre-test. During this phase, the researcher taught the selected collocations to all groups. The same instructor delivered all lessons to control for teacher effect. The instructor explicitly explained the meanings and variations of each collocation, while also highlighting the restrictions on how words collocate. The experimental groups received the technological intervention, engaging in audio-based shadowing using the setup described in the 'Technological

Intervention' section. They used headphones to listen to the digital audio recordings of the collocations while simultaneously reading the relevant texts and repeating the phrases.

During the treatment phase, the same instructor taught the selected collocations to all groups. For the control groups, instruction involved explicit teacher explanation of each collocation—including meaning, usage, and syntactic restrictions—followed by silent reading of the texts containing the target collocations. Additionally, learners in the control groups completed brief, silent vocabulary exercises (e.g., matching collocations to definitions, filling in blanks) based on the texts, without any auditory input. This ensured that the control condition remained active and pedagogically structured, differing from the experimental condition primarily in the absence of audio-shadowing practice, not in the absence of instruction or engagement."

At the conclusion of the treatment, a post-test was administered to all groups to evaluate the effectiveness of shadow listening on collocation knowledge and to identify any gender differences in learning outcomes.

4.4. The Technological Intervention: Audio Shadowing Setup

The technological intervention for the experimental groups involved a structured audio-shadowing procedure using VLC Media Player (version 3.0.16), a freely available and widely used digital media playback software. The software was installed on standard Windows 10 desktop computers provided by the institute. Each learner was equipped with a pair of closed-back, over-ear headphones (Model: Sony MDR-ZX110) to ensure clear audio reception and minimize external noise.

The audio materials were professionally recorded in a sound-attenuated booth by a female native English speaker with a background in EFL instruction. The recordings were made using a Shure SM58 microphone and saved in WAV format (44.1 kHz, 16-bit, mono) to ensure high clarity and consistency. Each collocation was embedded in a short,

meaningful sentence context (e.g., “She decided to *make a call* before leaving”).

The playback was standardized across all sessions. The initial playback speed was set to 100% (normal speed). Learners were instructed to listen to each sentence once at normal speed, then immediately repeat (shadow) the collocation phrase aloud while the sentence continued to play. No artificial pauses were inserted between repetitions; shadowing was performed concurrently with ongoing playback.

Each collocation sentence was looped three times in succession. Learners shadowed the target collocation during each loop. The software’s built-in looping function was used, with a 500-millisecond gap between loops. Learners could not adjust the speed themselves; however, the instructor monitored the session and, if more than 50% of learners showed difficulty (based on real-time observation), the speed was reduced to 90% for the subsequent loop set. This adjustment occurred in fewer than 10% of the practice sequences. Learners also had access to a printed text displaying the full sentence with the target collocation bolded. They were instructed to read the text silently while listening and shadowing. Each 90-minute session included 15 minutes of dedicated shadowing practice, during which learners engaged with 10–12 collocation sentences following the above protocol. The same procedure was repeated across all 10 instructional sessions.

5. Findings and Results

5.1. The Results of the Nelson Proficiency Test

The Nelson Proficiency Test (NPT) was utilized to select a homogeneous sample for this study. The initial pool comprised 300 learners who underwent the NPT, and from this cohort, learners scoring within one standard deviation above and below the mean were included in the final sample. Table 1 presents the descriptive statistics of participants’ NPT scores.

Table 1

Descriptive Statistics of the Participants’ Nelson Proficiency Test (NPT) Scores

	N	Minimum	Maximum	Mean	Std. Deviation
NPT	300	11	50	27.48	7.325
Valid N (listwise)	300				

As shown in Table 1, the overall mean of the initial participants’ NPT scores was 27.48, with a standard

deviation of 7.325. From these initial participants, 80 learners whose scores ranged from 21 to 34 were selected for inclusion in the experimental study.

5.2. Age as a Covariate

To ensure that the wide age range (14–30 years) did not systematically influence the results, two preliminary analyses were conducted. First, an Analysis of Covariance (ANCOVA) was performed with post-test collocation scores as the dependent variable, experimental condition

(shadowing vs. control) as the independent variable, and age as a covariate. The results (Table 2) indicated that age was not a significant covariate, $F(1,77) = 0.92, p = .341$, partial $\eta^2 = .012$, and the main effect of group remained significant after controlling for age. Second, a Pearson correlation between age and post-test gain scores (post-test – pre-test) revealed no significant relationship, $r(78) = .07, p = .526, r^2 = .005$.

Table 2

Results of Preliminary Statistical Analyses Testing the Influence of Age on Collocation Learning Outcomes

Analysis	Test Statistic	Degrees of Freedom	p-value	Effect Size / Correlation	Interpretation
ANCOVA (Age as Covariate)	$F = 0.92$	1,77	$p = .341$	Partial $\eta^2 = .012$	Age did not significantly covary with post-test scores.
Pearson Correlation (Age × Gain Scores)	$r = .07$	78	$p = .526$	$r^2 = .005$	

Therefore, the analyses displayed in Table 2 confirm that age did not moderate the treatment effect in this sample, allowing us to proceed with the main analyses without age adjustment.

5.3. The Results Regarding the First Research Question

To address the first research question both descriptive and inferential statistics were employed. The descriptive statistics for male participants in the experimental (EG) and control (CG) groups are displayed in Table 3.

Table 3

Descriptive Statistics of Pre-Test and Post-Test Collocation Scores by Group and Gender

Gender	Test Type	N	Minimum	Maximum	Mean	Std. Deviation
Males	Pre-Test (EG1)	20	8	33	19.85	8.002
	Pre-Test (CG1)	20	8	31	19.95	7.366
	Post-Test (EG1)	20	21	40	30.50	5.808
	Post-Test (CG1)	20	14	40	25.10	8.188
Females	Pre-Test (EG2)	20	7	32	19.80	7.824
	Pre-Test (CG2)	20	9	32	19.90	7.476
	Post-Test (EG2)	20	18	39	29.70	5.983
	Post-Test (CG2)	20	9	38	24.40	9.533

Table 3 presents the descriptive statistics of pre-test and post-test scores for both male and female participants in the experimental (EG) and control (CG) groups. Each gender group consisted of 20 participants. For males, the mean pre-test score in the experimental group was 19.85, while the control group had a slightly higher mean of 19.95. After the intervention, males in the experimental group showed a significant improvement, achieving a mean post-test score of 30.50, compared to 25.10 in the control group. In contrast, females had a pre-test mean of 19.80 in the

experimental group and 19.90 in the control group. Post-test results revealed that females in the experimental group scored a mean of 29.70, significantly higher than their control group counterparts, who had a mean score of 24.40. Overall, the results indicate improvements in collocational knowledge for both genders, with males and females benefiting from the shadow listening intervention.

To verify the assumption of normal distribution—an essential prerequisite for conducting parametric statistical analyses—the researcher performed One-Sample

Kolmogorov-Smirnov Tests on the male participants' scores. The results of this test are presented in Table 4.

Table 4

One-Sample Kolmogorov-Smirnov Test for Male and Female Participants' Collocation Test Scores

Gender	Test Type	N	Mean	Std. Dev.	Absolute D	Test Statistic	Asymp. Sig. (2-tailed)
Males	Pre-Test (EG)	20	19.85	8.002	.114	.114	.200
	Pre-Test (CG)	20	19.95	7.366	.104	.104	.200
	Post-Test (EG)	20	30.50	5.808	.102	.102	.200
	Post-Test (CG)	20	25.10	8.188	.148	.148	.200
Females	Pre-Test (EG)	20	19.80	7.824	.108	.108	.200
	Pre-Test (CG)	20	19.90	7.476	.107	.107	.200
	Post-Test (EG)	20	29.70	5.983	.136	.136	.200
	Post-Test (CG)	20	24.40	9.533	.131	.131	.200

Table 4 summarizes the results of the One-Sample Kolmogorov-Smirnov Tests conducted to verify the normality of distribution for collocation test scores among male and female participants. For both genders, the sample size (N) was consistently 20 across all groups. The mean and standard deviation for the male pre-test scores in the experimental and control groups were 19.85 (SD = 8.002) and 19.95 (SD = 7.366), respectively. In the post-test, the mean score for the experimental group was significantly higher at 30.50 (SD = 5.808) compared to the control group's mean of 25.10 (SD = 8.188). For females, the pre-test means were 19.80 (SD = 7.824) for the experimental group and 19.90 (SD = 7.476) for the control group, with

post-test scores of 29.70 (SD = 5.983) and 24.40 (SD = 9.533), respectively. The test statistics for all groups' scores were reported alongside the asymptotic significance (p-value), indicating that all groups met the normality assumption (p = .200) as the significance levels were above the critical threshold. Therefore, the p-values for all sets of scores were higher than 0.05, confirming that the assumption of normal distribution was met, and allowing for the use of parametric tests.

To answer the first research question, the researcher performed paired samples t-tests on the pre-test and post-test scores of male participants in both groups (Table 5).

Table 5

Paired Samples T-tests of Male Participants' Pre- and Post-Test Scores in the EG and CG

	Paired Differences		Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
	Mean	Std. Deviation		Lower	Upper			
	Males' Pre-test in EG - Males' Post-test in EG	-10.650		2.346	.525			
Males' Pre-test in CG - Males' Post-test in CG	-5.150	1.814	.406	-5.999	-4.301	-12.694	19	.000

Table 5 displays the results of the Paired Samples T-tests comparing male participants' pre-test and post-test scores in both the experimental group (EG) and control group (CG). The mean difference in scores for the experimental group was -10.650, with a standard deviation of 2.346, indicating a significant improvement in collocational knowledge post-intervention. The standard error of the mean difference was .525, and the 95% confidence interval for the difference ranged from -11.748 to -9.552, which does not encompass zero, confirming the significance of the results (t(19) = -20.304, p ≤ .001). In the

control group, the mean difference was -5.150, with a standard deviation of 1.814 and a standard error of .406. The confidence interval ranged from -5.999 to -4.301, also not including zero, and indicating a significant difference (t(19) = -12.694, p ≤ .001). These findings suggest that both groups showed improvements from pre-test to post-test, with the experimental group demonstrating a markedly greater enhancement in their collocational scores compared to the control group. This meant that the answer to the first research question was positive.

5.4. *The Results Regarding the Second Research Question*

To examine the second research hypothesis, a paired samples t-tests on the pre-test and post-test scores of female participants in both groups was conducted (Table 6).

Table 6

Paired Samples T-tests of Female Participants' Pre- and Post-Test Scores in the EG and CG

	Paired Differences			95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Females' Pre-test in EG - Females' Post-test in EG	-9.900	2.245	.502	-10.951	-8.849	-19.717	19	.000
Females' Pre-test in CG - Females' Post-test in CG	-4.500	2.763	.618	-5.793	-3.207	-7.285	19	.000

To answer the second research question, a paired-samples t-test was conducted on the pre-test and post-test scores of female participants in both the experimental and control groups. As displayed in Table 6, the results indicated a statistically significant increase in collocational knowledge for females in the experimental group from pre-test (M = 19.80, SD = 7.824) to post-test (M = 29.70, SD = 5.983), $t(19) = -19.717, p < .001$. Similarly, a significant improvement was also observed in the female control group from pre-test (M = 19.90, SD = 7.476) to post-test (M = 24.40, SD = 9.533), $t(19) = -7.285, p < .001$. However, the mean gain for the experimental group (Mean Difference = -9.900) was substantially larger than that of the control

group (Mean Difference = -4.500). This confirms that the answer to the second research question is positive, indicating that shadow listening significantly affected Iranian female EFL learners' knowledge of collocations.

5.5. *The Results Regarding the Third Research Question*

To answer the third research question, an independent samples t-test was conducted comparing male and female learners' performance in pretest and posttest on collocations (Table 7).

Table 7

Independent Samples T-tests of Male and Female Participants' Pre- and Post-Test Scores in the EG

	Levene's Test for Equality of Variances		t-test for Equality of Means			Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
	F	Sig.	t	df	Sig. (2-tailed)			Lower	Upper	
Pre-Test	Equal variances assumed	.016	.901	.020	38	.984	.050	2.502	-5.016	5.116
	Equal variances not assumed			.020	37.981	.984	.050	2.502	-5.016	5.116
Post-Test	Equal variances assumed	.017	.896	.429	38	.670	.800	1.865	-2.975	4.575
	Equal variances not assumed			.429	37.967	.670	.800	1.865	-2.975	4.575

As shown in Table 7, Levene's test confirmed the homogeneity of variances for both pre-test (F = .016, p = .901) and post-test (F = .017, p = .896) scores. The independent samples t-test revealed no significant difference between male and female participants' knowledge before the intervention ($t(38) = .020, p = .984$). Crucially, the analysis of post-test scores also showed no

significant difference between the two genders after the intervention ($t(38) = .429, p = .670$). It can therefore be concluded that while the audio-based shadowing was highly effective for both groups, its impact on collocational knowledge did not differ significantly between male and female learners.

6. Discussion

This study contributes to the existing literature by providing a targeted investigation into gender differences within a technology-mediated shadowing framework for collocation acquisition. Although prior shadowing studies (e.g., (Hikmat & Hasan, 2022; Lestari, 2023)) have included participants of both genders and reported overall effectiveness, they did not explicitly analyze gender as an independent variable in the context of collocation learning. Our research therefore fills a specific gap by systematically evaluating whether gender moderates the effectiveness of a low-threshold audio-shadowing intervention for a discrete and challenging area of vocabulary knowledge. The finding of no significant gender difference reinforces the inclusive potential of this method, suggesting it is equally effective across genders when applied to collocation learning. While Hikmat and Hasan (2022) explored gender differences in shadowing within the context of simultaneous interpreting, their findings align with the current study, showing no significant differences between genders. This consistency suggests that shadowing may provide a universally beneficial learning strategy, irrespective of gender, supporting the idea that both male and female learners can equally benefit from this technique in language learning contexts.

In contrast to the lack of gender differences observed in this study, previous research has highlighted the positive effects of shadowing on language learning without focusing on gender. For instance, Lestari (2023) found that shadowing significantly improved students' listening comprehension abilities. Similarly, Ekayati (2020) reported that the shadowing technique positively influenced students' listening skills in word recognition. These studies corroborate the current findings, reinforcing the argument that shadow listening is an effective pedagogical tool for enhancing various aspects of language proficiency, including collocation knowledge.

Several factors may explain the observed improvements in collocation knowledge among participants. First, the shadowing technology created a dynamic and interactive learning environment, promoting active participation. This aligns with the Cognitive-Affective Theory of Learning with Media, which posits that technology can effectively guide cognitive processes. Erol et al. (2015) emphasize that learner-centered settings facilitate active learning, allowing students to take charge of their educational experiences. This aligns with the theories posited by Simons et al.

(2000), which advocate for self-directed learning as a means of enhancing learner engagement and accountability. The active involvement of learners in shadow listening likely contributed to their improved performance in collocation tasks.

Moreover, the motivational aspects of shadow listening cannot be overlooked. The self-paced, private nature of the technological setup likely reduced learning anxiety, as learners could practice without the fear of public judgment. According to Gilakjani and Ahmadi (2011) and Hamada (2015), such supportive activities enhance learners' motivation to acquire new language skills. In this study, participants were able to read along with the text while shadowing, which likely facilitated their understanding and retention of collocations. Bandura (1993) suggests that an environment prioritizing learner achievement fosters self-efficacy, which, in turn, enhances academic performance. The positive feedback loop created by shadow listening may have contributed to the participants' confidence and motivation to engage with collocations. This highlights a key advantage of technology-mediated practice: the creation of a safe space for skill development.

Another critical factor is the reduction of anxiety associated with language learning. Chung (2010) notes that shadowing can create a less stressful environment for learners. In this study, participants had the autonomy to practice shadowing without the immediate judgment of peers or instructors, allowing for a more relaxed learning experience. This freedom likely encouraged learners to take risks and experiment with their pronunciation and understanding of collocations, which is supported by Hsieh et al. (2013), who found that such an environment reduces anxiety and promotes self-expression.

Additionally, shadow listening appears to enhance learner confidence. Participants had ample opportunity to practice their pronunciation of collocations without direct instructor intervention, which aligns with Kadota (2007) findings that shadowing reinforces cognitive processes in working memory through repetition. This repetition may have allowed learners to internalize collocations more effectively, leading to increased confidence in their language abilities. Although not explicitly addressed in this study, it can be inferred that the reflective nature of shadowing—where learners digest and contemplate phrases before attempting to replicate them—contributed to their overall self-assurance.

It is important to note that the control group engaged in active, teacher-led vocabulary instruction and text-based

exercises, not passive reading alone. This design allowed us to isolate the specific contribution of audio-shadowing beyond what could be achieved through explicit explanation and silent practice. While the control condition was pedagogically sound, the experimental group's superior gains highlight the unique value of adding synchronized auditory-motor practice to collocation instruction.

The findings of this study underscore the effectiveness of shadow listening as a pedagogical approach for improving collocation knowledge among EFL learners, regardless of gender. The lack of significant differences between male and female participants suggests that shadow listening can serve as an inclusive strategy that benefits all learners. This aligns with the broader literature on language learning, which consistently highlights the advantages of active, engaging, and supportive learning environments.

Generally, this research contributes to the growing body of literature on shadow listening and its implications for language teaching. Future studies could explore the long-term effects of shadow listening on language retention and proficiency, as well as its applicability in various language learning contexts. Additionally, investigating the potential differences in shadowing effectiveness across different age groups or proficiency levels could provide further insights into optimizing language instruction.

In conclusion, the results of this study highlight the significance of shadow listening in enhancing collocation knowledge among Iranian EFL learners. The findings not only contribute to the theoretical understanding of shadowing as a teaching technique but also offer practical implications for educators seeking to implement effective strategies in their classrooms. As language education continues to evolve, embracing innovative approaches like shadow listening will be crucial in fostering learner engagement and success in acquiring new language skills. The significant gains from a relatively simple audio technology have profound implications for the development of more advanced AI-driven language learning tools. Our findings suggest that the core mechanism—providing synchronized aural and visual input—is highly effective. Future AI tutors could dynamically generate personalized shadowing exercises based on a learner's proficiency, focusing on their weak collocations. Furthermore, speech recognition AI could be integrated to provide immediate feedback on the learner's pronunciation and timing during shadowing, transforming it from a passive rehearsal task into an interactive, feedback-rich activity. This study thus

serves as an empirical validation for a core feature that should be incorporated into the next generation of intelligent language learning applications. For instance, an AI tutor could use a pre-test to identify that a learner struggles with 'verb-noun' collocations like 'make a decision' and 'do homework'. It would then dynamically generate a shadowing exercise packed with similar collocations, adjusting the speech rate based on the learner's performance. Integrated speech recognition could then provide feedback not just on pronunciation, but on the fluency of producing the entire chunk, moving beyond individual words.

Although the absence of a delayed post-test limits conclusions about long-term retention, the significant immediate gains demonstrate the strong initial learning potential of audio-shadowing for collocation acquisition—a prerequisite for lasting vocabulary knowledge."

7. Limitations and Directions for Future Research

This study acknowledges several limitations that qualify its findings and suggest productive avenues for further inquiry. Methodologically, the technological intervention employed was relatively basic; future research could integrate speech recognition software to provide automated feedback on pronunciation and timing, thereby advancing towards a more interactive, AI-driven tutoring system.

Furthermore, the absence of a delayed post-test limits conclusions regarding long-term retention; subsequent studies should include such a measure to assess the durability of knowledge gains.

To enhance internal validity, stricter controls are needed: the lack of standardized instructional scripts or video-recorded sessions means subtle variations in teaching delivery could have influenced outcomes, advocating for scripted instruction or digital tutorials in future replications.

Additionally, the study did not implement a blind design, as the researcher administered tests and instructed participants, potentially introducing scoring bias; blinded scoring by an independent rater is recommended. A finer-grained analysis was also precluded as learners' shadowing performances were not audio-recorded; such recordings would permit detailed investigation into fluency, accuracy, and phonological development.

Finally, the use of convenience sampling and a wide participant age range (14–30 years) constrains the generalizability of the results, underscoring the need for

replication with random sampling and more homogeneous demographic groups.

8. Conclusion

The findings of this study provide compelling evidence for the efficacy of shadow listening in enhancing Iranian EFL learners' knowledge of English collocations. This research aligns with recent literature emphasizing the significance of active engagement in language learning. Techniques such as shadowing, which stimulate working memory through the simultaneous processing of auditory and verbal tasks, effectively facilitate language acquisition (Hamada, 2024; Hamada & Suzuki, 2021). The outcomes indicated a notable improvement in collocation knowledge for both male and female participants, with no significant differences observed between genders, suggesting that the shadowing technique is universally beneficial for EFL learners. This reflects the broader consensus in the literature that varied strategies can be applied equitably across diverse learner populations to enhance language proficiency.

The pedagogical implications of these findings are substantial for educators and curriculum developers. By highlighting the positive effects of shadowing on both academic performance and learner motivation, the research encourages a shift in pedagogical practices toward more interactive and engaging methodologies. Teachers are urged to incorporate shadowing into their curriculum to create a stimulating learning environment that fosters language proficiency (Yuksaj & Chan, 2019). Furthermore, the study advocates for the integration of innovative techniques into teaching materials, prompting textbook authors to include shadowing exercises that align with the specific needs of Iranian EFL learners. This not only enhances the relevance of instructional resources but also aligns with current trends that prioritize learner-centered approaches in language education (Huang et al., 2022).

Therefore, this research contributes to the growing body of literature on shadow listening and its implications for language teaching. Future studies could explore the long-term effects of shadow listening on language retention and proficiency, as well as its applicability in various language learning contexts. Additionally, investigating the potential differences in shadowing effectiveness across different age groups or proficiency levels could provide further insights into optimizing language instruction. Looking to the future, this study lays the groundwork for further research in the

area of language acquisition. Subsequent studies could broaden the scope by exploring the effects of shadowing across various educational settings and learner demographics in Iran, thereby enriching the existing body of knowledge. Qualitative research methodologies, such as interviews and classroom observations, can provide deeper insights into learners' experiences and responses to shadowing techniques (Jeremy & Spandagou, 2025). By addressing these aspects, future research can enhance our understanding of the mechanism behind shadowing's effectiveness and contribute to the ongoing evolution of instructional strategies tailored to the needs of EFL learners.

Despite the **context-specific sample**, this study provides preliminary evidence that low-threshold shadowing technology can enhance collocation learning among intermediate EFL learners in institutional settings. The findings offer a **proof of concept** that merits replication in more diverse and randomly sampled populations.

In conclusion, while the present study utilized a basic form of learning technology, its success underscores the immense potential of **data-driven, intelligent systems** in language education. Future research should explore the integration of shadowing with **AI-powered adaptive learning platforms** and **automated speech recognition** to create a more holistic and responsive learning experience. The journey from simple audio shadowing to AI-powered conversational practice is a continuum, and this research provides a solid stepping stone on that path. The demonstrated efficacy of a low-threshold technology is particularly significant for educational contexts with limited resources. It provides a scalable and affordable model for improving language proficiency without requiring expensive hardware or complex software, making quality instruction more accessible.

The demonstrated efficacy of a low-threshold technology is particularly significant for educational contexts with limited resources. It provides a scalable and affordable model for improving language proficiency without requiring expensive hardware or complex software, making quality instruction more accessible.

9. Conclusion

This study, aimed at exploring the impact of the digital sharing economy on the financial behaviors of Iran's Generation Z, opens a new window into understanding the complexities of financial conduct in the digital age. The

findings go beyond merely confirming or rejecting the initial hypotheses, revealing a multilayered pattern of interactions among technology, psychology, and socio-economic structures that presents significant theoretical and practical challenges for researchers and policymakers alike.

The most important theoretical contribution of this research lies in identifying the fundamental duality in the drivers of financial behavior. While technological factors act as the driving force behind risk-taking investments ($\beta = 0.508$), psychological factors play a decisive role in shaping stable saving behavior ($\beta = 0.443$). This finding challenges traditional paradigms that view financial behavior as a homogeneous phenomenon, highlighting the need to rethink theoretical models of financial behavior within the context of the digital era.

This apparent dichotomy between investment and savings drivers, where investment is driven by technology while savings is rooted in psychological factors, challenges traditional, monolithic models of financial behavior. This finding can be more effectively articulated through the lens of recent cross-cultural and intergenerational financial literature. The dominance of technological factors in shaping investment behavior is consistent with the financial gamification hypothesis observed in global studies; For example, a comprehensive report by the CFA Institute (2023), which compares Generation Z investors across the United States, Canada, the United Kingdom, and China, shows that this cohort's entry into investing is heavily mediated by digital interfaces, social media, and fin-influencers, making the medium (technology) the primary driver of the act (investment). Unlike older generations, investment decisions among Generation Z follow a different pattern. Older generations often rely on long-term security concerns and traditional advisory relationships. In contrast, Generation Z shows intense engagement with digital applications. They also prefer digital assets such as cryptocurrencies. Conversely, the finding that saving behavior continues to be rooted more in psychological factors (trust and attitude) than in technology reflects the cultural persistence theory of saving behavior proposed by (Costa-Font et al., 2018). Their research shows that while investment tools rapidly evolve through technological innovations, saving tendencies remain deeply embedded in cultural norms and individual risk preferences that extend beyond mere technological access.

Thomas et al. (2024) conducted a comparative generational analysis in India (Thomas et al., 2024). They found that Generation Z shows the highest risk tolerance

for investments, which is a technology-enabled characteristic. However, their fundamental financial security still depends on psychological comfort and perceived stability. In this sense, they are similar to both Generation Y and Generation X. Therefore, the duality observed in our study reflects a broader generational paradox: Generation Z uses technology to take risks (investment), yet depends on psychological foundations to reduce uncertainty (saving).

The discovery of the inhibitory role of demographic factors reveals yet another dimension of complexity. Contrary to conventional expectations, the youngest members of Generation Z with the lowest levels of formal education emerge as the pioneers of digital financial transformation. This paradoxical finding extends the concept of digital natives beyond the realm of technical skills into the domain of financial behaviors, demonstrating that the generational gap in finance is far deeper and more complex than previously assumed.

The limited role of the digital sharing economy in transforming financial behavior ($\beta = 0.069$ for investment and $\beta = 0.184$ for saving) serves as a reminder that technological innovation alone does not guarantee behavioral transformation. Despite their impressive quantitative growth, these platforms have not yet evolved into the primary catalysts for financial change. This finding underscores the importance of strategically and purposefully designing digital financial services that go beyond mere digitalization to generate meaningful behavioral value.

From a practical perspective, the findings of this study offer clear guidance for policymakers and financial institutions. First, there is a need to adopt differentiated approaches to promote investment and saving. While the development of technological infrastructure can act as a strong stimulus for investment, fostering a saving culture requires investment in educational programs and building trust in the financial ecosystem. Second, the redesign of financial products and services must align with the unique characteristics of Generation Z, reducing entry barriers while ensuring security and sustainability. Third, it is crucial to build bridges between sharing economy platforms and traditional financial services to convert short-term savings into long-term financial behaviors.

Policymakers can use these findings to design targeted programs to improve digital financial literacy and promote trust in online financial ecosystems. Platform developers can integrate micro-savings or investment features into

sharing apps, allowing users to turn small savings into capital accumulation. Educational institutions can also incorporate digital finance education into youth curricula to foster responsible financial participation. These measures collectively translate the theoretical insights of this study into actionable strategies for sustainable financial behavior among Generation Z.

The limitations of this study, including its focus on the geographical context of Iran and the use of cross-sectional data, pave the way for future research. Longitudinal studies that can track the evolution of financial behaviors over time, cross-cultural comparative analyses, and deeper examinations of the underlying psychological mechanisms are among the promising directions for further investigation. Moreover, exploring the role of mediating variables such as digital financial literacy and the impact of social networks on financial behaviors could enrich our understanding of this complex phenomenon.

Ultimately, this study demonstrates that the financial transformation of Generation Z in Iran is a multifaceted process shaped not solely by technology or socio-cultural change, but by the intricate interaction among these factors. Success in steering this transformation toward sustainable and constructive financial behaviors requires a deep understanding of these complexities and the design of intelligent interventions that simultaneously address technological, psychological, and structural dimensions. It is hoped that the findings of this research represent a meaningful step toward achieving this important goal.

Authors' Contributions

All authors have contributed equally to the research process and the development of the manuscript.

Declaration

Deep Seek has partly been consulted for language editing of the paper.

Transparency Statement

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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APPENDIX

Collocation Pre- and Post-tests

Note: This test consists of 40 test items (1-40). Each test item contains three-word combinations marked a), b), and c). Your task is to choose one of the three-word combinations in each item. One of the three-word combinations in each item is a natural and frequent word combination occurring in the English language, whereas the other two are not. Choose the word combination you think is the most natural and frequently occurring by ticking the box that corresponds to it in the right margin.

No.				Your Choice		
1	a.	do damage	b.	make damage	c.	run damage
2	a.	turn out a fire	b.	put out a fire	c.	set out a fire
3	a.	hold discussions	b.	make discussions	c.	set discussions
4	a.	receive a cold	b.	achieve a cold	c.	catch a cold
5	a.	do a visit	b.	hit a visit	c.	pay a visit
6	a.	strike a pose	b.	lead a pose	c.	hit a pose
7	a.	fell tears	b.	shed tears	c.	raise tears
8	a.	employ one's rights	b.	exercise one's rights	c.	conduct one's rights
9	a.	grab an opportunity	b.	seize an opportunity	c.	catch an opportunity
10	a.	bring charges	b.	run charges	c.	push charges
11	a.	lend a complaint	b.	perform a complaint	c.	lodge a complaint
12	a.	make a conclusion	b.	pull a conclusion	c.	draw a conclusion
13	a.	commit a crime	b.	comply a crime	c.	conduct a crime
14	a.	tell a prayer	b.	say a prayer	c.	speak a prayer

15	a.	give a speech	b.	hold a speech	c.	perform a speech
16	a.	strike a deal	b.	set a deal	c.	step a deal
17	a.	go on a journey	b.	do a journey	c.	pull a journey
18	a.	keep one's breath	b.	house one's breath	c.	hold one's breath
19	a.	direct an orchestra	b.	conduct an orchestra	c.	control an orchestra
20	a.	lose count	b.	drop count	c.	pass count
21	a.	take root	b.	make root	c.	stick root
22	a.	hold one's balance	b.	keep one's balance	c.	last one's balance
23	a.	take one's revenge	b.	make one's revenge	c.	obtain one's revenge
24	a.	keep a diary	b.	run a diary	c.	tend a diary
25	a.	brush shoes	b.	polish shoes	c.	tidy shoes
26	a.	make apologies	b.	do apologies	c.	lay apologies
27	a.	tie one's fist	b.	fix one's fist	c.	clench one's fist
28	a.	strike a fuse	b.	knock a fuse	c.	blow a fuse
29	a.	show heed	b.	pay heed	c.	spread heed
30	a.	make an escape	b.	take an escape	c.	draw an escape
31	a.	lose faith	b.	drop faith	c.	cut faith
32	a.	perform a survey	b.	commit a survey	c.	conduct a survey
33	a.	push a bike	b.	lead a bike	c.	press a bike
34	a.	send judgement	b.	pass judgement	c.	set judgement
35	a.	say one's mind	b.	speak one's mind	c.	talk one's mind
36	a.	spoil the fun	b.	ruin the fun	c.	destroy the fun
37	a.	earn a purpose	b.	win a purpose	c.	serve a purpose
38	a.	make friends	b.	create friends	c.	gain friends
39	a.	make measures	b.	take measures	c.	stick measures
40	a.	speak shop	b.	say shop	c.	talk shop
