The University of Tehran Press

Journal of Foreign Language Research

Online ISSN: 2588-7521

Journal Homepage: https://jflr.ut.ac.ir/

The Impact of Technology-Assisted Learner Agency on EFL Learners' Listening Comprehension Skill and Metacognitive Awareness

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Article Info

Article type:
Research Article

Article history:
Received: 2 January 2026
Received in revised form: 23 April 2026
Accepted: 27 April 2026
Available online : 22 June 2026

Keywords:
Learner agency;
Listening comprehension;
Metacognitive awareness in listening comprehension;
Technology

ABSTRACT

Purpose: Learner agency plays a central role in self-regulated learning in English as a Foreign Language (EFL) contexts and technology can strengthen it by providing flexible, interactive, and learner-centered learning opportunities. Listening comprehension, because of its reliance on simultaneous cognitive processing and strategic awareness, offers an appropriate context for examining this relationship.

Method: The present study employed a quasi-experimental design supplemented by qualitative inquiry to investigate the effect of Technology-Assisted Learner Agency (TALA) on listening comprehension and metacognitive awareness. A total of 44 intermediate-level EFL learners, aged 14–17, were assigned to three groups: the TALA group, which engaged in self-directed listening through YouTube and language-learning websites; the controlled technology-use group, which participated in teacher-guided technology-based listening activities; and the textbook-based control group, which received conventional instruction. Data were collected through listening comprehension pretests and posttests, the Metacognitive Awareness Listening Questionnaire (MALQ), and semi-structured interviews.

Findings: The findings revealed that both technology-supported groups significantly outperformed the control group in listening comprehension, with the TALA group demonstrating the greatest improvement. Furthermore, learners in the TALA group reported higher levels of metacognitive awareness, particularly in planning, directed attention, and problem-solving.

Conclusion: These findings highlight the value of combining digital technologies with learner autonomy to promote strategic listening, improve comprehension outcomes, and foster greater learner agency in EFL instruction.

Cite this article: Moghimi,J , Hemmati,F , Khodabandeh,F and Sharifi,R . (2026). The Impact of Technology-Assisted Learner Agency on EFL Learners' Listening Comprehension Skill and Metacognitive Awareness. *Journal of Foreign Language Research*, *16*(2), 375-408. https://doi.org/ 10.22059/jflr.2026.412140.1281

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DOI: https://doi.org/ 10.22059/jflr.2026.412140.1281

1. Introduction

Learner agency, which is commonly defined as learners' ability to take ownership of their own learning process, has increasingly become one of the important topics in educational research, particularly in the field of second language acquisition. This concept not only includes the ability to direct one's own learning (Mercer, 2011), but also encompasses the capacity to reflect on how the learning process develops (Levy & Pooner, 2018). This concept can be explained within the framework of Bandura's (2001) Social Cognitive Theory, which emphasizes the role of self-efficacy and the interaction between personal and environmental factors in shaping behavior. From this perspective, agency enables learners to regulate their cognitive, emotional, and behavioral engagement in different contexts (Code, 2020). Research has also associated learner agency with identity formation in second language learning (Teng, 2019; Teng, 2024; Xiao, 2014) and has shown that this construct can influence not only learners' performance but also their understanding of themselves. A growing body of second language acquisition research has emphasized the role of learner agency in strengthening motivation, autonomy, and self-regulated learning (He et al., 2024; Lai, 2013; Luo, 2024; Marta & Valdiviezo, 2022; Teng & Wang, 2023), and has thereby highlighted its potential for promoting learner-directed learning across a range of English as a Foreign Language (EFL) and English as a Second Language (ESL) contexts.

Despite the attention given to learner agency in different areas of language learning, listening comprehension represents a particularly informative skill for examining its effects. Listening forms the foundation of effective communication and deeper cognitive engagement with the target language (Zhang et al., 2023). This skill requires the active and moment-by-moment regulation of cognitive processes and, therefore, provides an ideal context for investigating learner agency. Its close relationship with metacognitive awareness (Vandergrift et al., 2006; Yeldham, 2017) further strengthens this argument, because metacognitive awareness in listening helps learners plan, monitor, and regulate their comprehension strategies (Maftoon & Alamdari, 2020; Rahimi & Katal, 2012; Shaoji et al., 2024; Zhang & Xu, 2025). Research evidence has consistently shown that higher levels of metacognitive awareness in listening are associated with stronger learning outcomes (Cross, 2010; Goh & Taib, 2006; Shaoji et al., 2024; Siegel, 2013; Zhang & Xu, 2025).

In the digital era, technology can provide valuable opportunities for improving listening skills and strengthening learner agency. Multimedia platforms, mobile-assisted language learning (MALL), and immersive environments such as virtual reality provide rich, context-based listening experiences that support vocabulary development, grammatical awareness, and overall comprehension (Tai, 2022; Zhang & Zou, 2022). Such tools enable learners to practice

in authentic and meaningful situations, and this can enhance both linguistic accuracy and the long-term retention of learning (Pyo & Lee, 2024; Wang & Tai, 2024). On the other hand, technology can function as a catalyst for learner agency because it gives learners greater control over how, when, and what they practice, encourages self-regulated learning, and supports personalized approaches (Fadhilah & Tarihoran, 2024; Lai, 2022; Liu & Chao, 2018; Reinhardt, 2022; Reinders & White, 2016). Resources such as YouTube or specialized EFL websites provide examples of dynamic learner agency (Godwin-Jones, 2024; Viberg & Kukulska-Hulme, 2022) and give learners the freedom to choose content that matches their interests, goals, and proficiency levels. In addition, features such as playback speed adjustment and subtitles allow them to further adapt their listening experience to their individual needs.

Despite these advantages, there is still a lack of research that directly examines how technology-assisted learner agency (TALA) can influence listening comprehension and metacognitive awareness in listening. Given the growing recognition of learner agency as a multidimensional construct (Mercer, 2011; Nguyen & Bui, 2023) and the movement toward learner-centered approaches in education (Kheng & Newton, 2023; Pan, 2023), it seems necessary to investigate how digital tools can be utilized not only to strengthen listening comprehension but also to foster the strategic behaviors that support it.

Although previous studies have examined the role of technology in improving listening skills (Pyo & Lee, 2024; Zhang & Zou, 2022) and the role of learner agency in enhancing autonomy, motivation, and self-regulated learning (Teng, 2019; Teng & Wang, 2023), fewer studies have integrated these two areas within a single framework and have simultaneously examined the effect of TALA on listening comprehension and metacognitive awareness. Furthermore, most previous studies have either focused on teacher-directed use of technology or investigated general language learning outcomes, whereas the role of learners' own choice, control, and management of learning activities has received less attention. Therefore, a gap still exists in the research literature regarding the mechanisms through which technology-based learner agency influences listening learning processes and outcomes.

The present study addresses this gap by examining the effect of TALA, which is operationalized through learners' independent use of YouTube and EFL learning websites, in comparison with controlled technology use and traditional textbook-based instruction. This study also analyzes learners' preferences regarding technology-based listening activities in order to clarify how learner agency shapes the digital learning experience. Accordingly, the following research questions were posed:

1. What are the effects of learner agency with the help of technology and the controlled use of technology on the listening comprehension of English learners as a foreign language in comparison with traditional textbook-based education?
2. What impact does learner agency with the help of technology and the controlled use of technology have on metacognitive awareness in listening among English learners as a foreign language, in comparison with the traditional control group?
3. When applying agency, which technologies and activities do language learners prefer for the development of listening skills?

The findings of this study can provide practical guidance for English language teachers as a foreign language and curriculum designers who seek to integrate agency in technology-enhanced teachings. Understanding language learners' preferences and the way they engage strategically can help in designing more autonomous, more motivating, and more effective listening activities. Furthermore, the results of the research can guide institutional efforts to employ digital tools that simultaneously promote metacognitive growth and listening skills.

1.1. Theoretical Framework of the Study

The present study is based on the assumption that explaining the relationship between TALA, metacognitive awareness, and listening comprehension requires a multidimensional view of the language learning process. Although each of the proposed theories in the field of language learning explains valuable dimensions of this process, none of them alone is able to comprehensively explain the complex interaction among individual, motivational, social, and technological factors that play a role in the formation of learner agency. For example, some theories emphasize cognitive and motivational processes, whereas others highlight the role of social interactions or learning environments; however, none of them alone can explain how technology, through creating opportunities for choice, self-regulation, and interaction with digital resources, leads to the formation of learner agency and ultimately the enhancement of metacognitive awareness and listening performance.

Accordingly, the theoretical framework of this study has been designed through integrating four complementary perspectives, including Complex Dynamic Systems Theory (Larsen-Freeman, 2019), Sociocultural Theory (Vygotsky, 1978), Social Cognitive Theory (Bandura, 2001), and Self-Determination Theory (Deci & Ryan, 1985). This integration is not merely the placement of several theories alongside each other; rather, it is an attempt to provide a multi-level explanation of the phenomenon of TALA. Within this framework, each theory explains a part of the mechanisms influencing the formation of TALA and, together with the other theories, provides a coherent picture of the relationships among technology, learner agency, metacognitive awareness, and listening comprehension.

In this integrated model, Complex Dynamic Systems Theory explains the evolving and context-dependent nature of learner agency; Sociocultural Theory demonstrates how technology, as a mediational tool, provides new opportunities for interaction and learning; Social Cognitive Theory explains the role of self-efficacy and perceived control in the application of cognitive and metacognitive strategies; and Self-Determination Theory clarifies the motivational mechanisms underlying learners' choice, autonomy, and active participation. Therefore, in the present study, TALA is considered not as a purely individual or purely technological characteristic, but rather as a dynamic and multi-level construct that emerges from the continuous interaction of cognitive, motivational, social, and technological factors.

First, Complex Dynamic Systems Theory (Larsen-Freeman, 2019) considers language learning as a nonlinear, dynamic process that is dependent on the continuous interaction of individual, social, and environmental factors. From this perspective, learner agency is not a predetermined or fixed characteristic, but rather it is continuously reconstructed and transformed as a result of the learner's ongoing interaction with the learning environment, available resources, and previous experiences. Therefore, the degree of a learner's agency may change in different situations and may be influenced by the opportunities and constraints of the learning environment.

The application of this perspective in digital learning environments gains particular importance because technology transforms the learning environment from a relatively fixed and teacher-centered space into a dynamic, open, and resource-rich environment. Tools such as YouTube and language learning websites provide learners with the opportunity to select resources, regulate their learning paths, control the pace of learning, and repeatedly review content. From the perspective of Complex Dynamic Systems Theory, these affordances are not merely technological features; rather, they provide conditions in which agency can gradually develop, become stabilized, or even be transformed as a result of changes in learning conditions. Accordingly, this theory emphasizes the continuous dynamics of the interaction among the learner, technology, and the learning environment rather than drawing a linear relationship between technology and learning.

Despite this, Complex Dynamic Systems Theory mainly focuses on explaining how learner agency develops and changes and provides less explanation of the psychological mechanisms or the role of mediational tools in this transformation. In other words, this theory clarifies how agency is formed through interaction with the environment, but it specifies less clearly how technology exactly facilitates this interaction or how learners' choices and activities are transformed into the learning process. Therefore, to explain the role of technology as a

mediational tool in the formation of learner agency, drawing on Sociocultural Theory seems necessary.

Within this framework, Sociocultural Theory (Vygotsky, 1978) highlights the role of mediational tools and social interactions in the learning process. Unlike cognitive perspectives that consider learning mainly as the result of individuals' internal processes, this theory maintains that cognitive development is formed within the context of interaction with others and through the use of cultural tools. From this perspective, learners develop their knowledge and skills not passively, but through participation in meaningful activities and interaction with the surrounding environment.

Within this framework, technology is not merely a means for transferring educational content; rather, it functions as a mediational tool that transforms the quality of learners' interaction with learning resources. Platforms such as YouTube and language learning websites provide opportunities for access to authentic input, receiving feedback, purposeful repetition, regulating learning speed, and interacting with various multimedia resources. These affordances not only create more opportunities for practicing listening skills, but also establish conditions in which learners can take greater responsibility for directing their own learning process. Consequently, from a sociocultural perspective, technology gains educational value when it can play an effective mediational role between the learner and the learning environment and expand opportunities for learner agency.

One of the fundamental concepts of this theory is the Zone of Proximal Development, which states that learners, when provided with appropriate support, will be able to demonstrate performance beyond their current abilities. In digital learning environments, this support is not necessarily provided by the teacher or peers; rather, it can also be achieved through technological affordances. For example, the use of subtitles, adjusting playback speed, repeatedly viewing listening content, receiving feedback from online exercises, or using resources appropriate to learners' language levels are all examples of technological mediation that can play a similar supportive role. From this perspective, TALA does not merely mean freedom in selecting resources; rather, it refers to the conscious use of technological mediational affordances to advance the learning process.

Despite this, Sociocultural Theory focuses more on the role of the environment and mediational tools rather than on individual differences. Therefore, although this theory explains well how technology provides learning opportunities, it is less clear about why some learners actively and strategically make use of these opportunities, whereas others, despite having access to similar resources, show less participation and progress. To answer this question, the individual mechanisms influencing the formation of learner agency, particularly the role of self-

efficacy and perceived control, need to be considered; an issue that is explained in Social Cognitive Theory.

Social Cognitive Theory (Bandura, 2001) addresses this gap by emphasizing the reciprocal interaction among individual, behavioral, and environmental factors. According to this theory, learners' behavior is influenced neither solely by the environment nor merely by individual characteristics; rather, it is the result of the continuous interaction among personal beliefs, learning behaviors, and environmental conditions. Within this framework, self-efficacy is considered one of the most important psychological mechanisms that determines the extent to which learners are willing to take responsibility for their own learning, demonstrate persistence when facing difficulties, and use effective strategies to achieve their goals.

This perspective is particularly important in the present study because TALA can lead to improved learning only when learners believe in their ability to manage digital resources, select appropriate activities, and direct the learning process. For example, two learners may have access to the same set of YouTube videos or educational websites; however, the extent to which they utilize these resources depends on their beliefs about their ability to use these affordances effectively. Therefore, self-efficacy can be considered the connecting link between the opportunities created by technology and learners' self-regulatory behaviors.

In addition, Social Cognitive Theory explains that self-efficacy encourages learners to use cognitive and metacognitive strategies purposefully, including planning, monitoring, and evaluating the listening process. This issue is particularly important in listening skills because speech comprehension requires continuous decision-making, control of attention, evaluation of the level of understanding, and modification of strategies while performing the task. Therefore, it is expected that learners with higher self-efficacy will use technological affordances more strategically and, consequently, experience better metacognitive awareness and listening performance.

However, although Social Cognitive Theory explains the role of individual beliefs and self-efficacy effectively, it pays less attention to the question of what factors cause learners to be willing to take responsibility for their own learning and become voluntarily engaged in learning activities. In other words, this theory explains how individuals act based on their beliefs, but it less clearly explains the origin of intrinsic motivation and the sense of autonomy. Therefore, to complete the theoretical model of the present study, drawing on Self-Determination Theory is necessary, as it explains the role of basic psychological needs and autonomous motivation in the formation of learner agency.

To complete the theoretical framework of the study, Self-Determination Theory (Deci & Ryan, 1985) explains the motivational mechanisms underlying learner agency. This theory is

based on the principle that the quality of learning depends not only on the level of ability or access to resources, but also on the type of motivation that guides learners' behavior. According to this perspective, three basic psychological needs, namely autonomy, competence, and relatedness, are prerequisites for the formation of intrinsic motivation and active participation in learning. The more these needs are satisfied, the more likely learners are to accept greater responsibility for their own learning, participate in educational activities with greater persistence, and employ more effective strategies.

The application of this theory in technology-based learning environments is of particular importance. Digital environments, especially platforms such as YouTube and language learning websites, provide extensive opportunities for selecting content, determining the pace of learning, reviewing materials, and adjusting the learning path based on individual interests and needs. However, from the perspective of Self-Determination Theory, these affordances lead to effective learning when they strengthen learners' sense of autonomy and competence. Therefore, technology is not a learning factor by itself; rather, it gains educational value when it provides the conditions for satisfying learners' psychological needs and encourages them to actively and self-directedly participate in the learning process.

This perspective also establishes a direct connection with metacognitive awareness. When learners participate in learning activities based on intrinsic motivation and with a sense of choice, they are more likely to use strategies such as planning, monitoring the learning process, evaluating performance, and modifying their strategies in order to achieve their goals. These processes constitute the main components of metacognitive awareness and can lead to deeper and more effective comprehension of listening messages. From this perspective, autonomy is considered not merely an educational outcome, but also one of the fundamental mechanisms in the development of metacognitive processes.

Although each of the four aforementioned theories explains part of the phenomenon under investigation, the novelty of the theoretical framework of the present study lies in integrating these perspectives within the framework of a single conceptual model. In this model, TALA is considered neither merely the result of access to technology, nor solely the product of individual characteristics, nor simply the consequence of social interactions; rather, it is a dynamic, multidimensional, and multi-level construct that is formed through the continuous interaction of individual, social, motivational, and technological factors.

Accordingly, the present study argues that technology does not directly lead to improvement in listening comprehension. What plays a determining role is the way learners interact with the affordances of technology and the extent of their agency in utilizing these affordances. By providing opportunities for choice, flexibility, access to diverse resources, and the possibility

of regulating the learning process, technology creates the conditions for the formation of learner agency; however, transforming these opportunities into effective learning requires learners to possess self-efficacy, autonomous motivation, and self-regulatory abilities. Consequently, the effect of technology on learning is indirect and depends on the activation of these psychological and educational mechanisms.

In the proposed model of this study, this process can be explained as a conceptual chain. First, digital learning environments provide opportunities for choice, control, and decision-making, thereby creating the conditions for the emergence of learner agency. This agency, through strengthening the sense of autonomy and self-efficacy, can lead learners toward the active use of self-regulatory strategies. Self-regulation, in turn, through increasing planning, monitoring, and evaluation of the listening process, leads to the enhancement of metacognitive awareness, and ultimately, this metacognitive awareness can result in improved learner performance in listening comprehension. Therefore, within the present theoretical framework, metacognitive awareness is conceptualized as an explanatory mechanism between TALA and success in listening skills.

Overall, the theoretical framework of the present study demonstrates that explaining the effects of TALA requires moving beyond single-factor perspectives and accepting the multidimensional nature of language learning. Complex Dynamic Systems Theory explains the transformation and dynamics of learner agency; Sociocultural Theory explains the role of technology as a mediational tool in creating learning opportunities; Social Cognitive Theory clarifies the psychological mechanisms, particularly self-efficacy and perceived control, in transforming these opportunities into strategic behaviors; and Self-Determination Theory demonstrates how autonomy and intrinsic motivation strengthen learners' active participation and self-regulation. The interaction of these four levels results in the formation of TALA, which, through enhancing metacognitive awareness, leads to improved listening comprehension. From this perspective, the theoretical framework of the present study is not merely an integration of several theories, but rather a conceptual model for explaining the mechanisms through which TALA influences cognitive and metacognitive outcomes of language learning.

2. Literature Review

Learner agency has emerged as a central concept in second language education and acquisition and refers to learners' capacity to perform conscious actions in shaping their own learning experiences (Gao, 2010; Henry-Leung, 2023). Agency, which was previously regarded as a fixed characteristic, is now considered a dynamic and relational process that is formed through continuous interaction with social, cultural, and material contexts (Lin, 2013; Miller,

2016; Nguyen & Bui, 2023). In English as a foreign language and second language contexts, agency supports learners' participation and autonomy and enables them to make informed decisions (Teng, 2019), actively engage in learning, and adjust their strategies in accordance with individual goals (He et al., 2024; Knight et al., 2017).

This review demonstrates how learner agency operates in English as a foreign language education and examines its growing intersection with technology, particularly in the development of listening comprehension and metacognitive awareness; two areas in which agency has increasingly emerged and been investigated.

2.1. Learner Agency and Second Language Acquisition

Learner agency is a fundamental element in English as a foreign language and second language learning, enabling learners to shape their educational paths through conscious decision-making and the strategic use of learning opportunities. Waugh et al. (2020) emphasize that agency is cultivated through classroom dialogic interactions, multimodal resources, and effective instructional practices and helps learners participate more actively and independently in the learning process.

Larsen-Freeman (2019), within the framework of Complex Dynamic Systems Theory (CDST), describes agency as a multidimensional and relational construct; a non-static phenomenon that is formed in an emergent and context-dependent manner through continuous adaptation to social, cultural, and material conditions. This dynamic perspective is consistent with the findings of Piccardo and North (2023); they consider agency as the core of second language acquisition and emphasize learners' proactive actions, such as selecting resources and modifying strategies, as key factors in shaping their autonomous learning trajectories, particularly in multilingual contexts.

Beyond structured learning environments, agency is also influenced by psychological and sociocultural factors, particularly in the self-directed use of technology. Lai (2013) demonstrated that learners' engagement with digital tools is closely related to motivation, perceived usefulness of technology, and the extent to which it aligns with individual learning goals. Lu (2024) extended these findings and showed that learners with higher levels of English proficiency usually demonstrate greater autonomy in seeking learning opportunities outside the classroom. External mediators, such as teachers or facilitators of access, can strengthen learners' agency by helping them effectively navigate resources.

Agency also has a close relationship with autonomy and identity in English as a foreign language contexts. Teng (2019) argues that agency reflects autonomy in action and enables learners to have meaningful control over their own learning. At the same time, identity affects how this autonomy is manifested and shapes motivation, self-confidence, and participation.

Teng et al. (2024) examined this dynamic among Indonesian student teachers and English as a foreign language learners in Vietnam and showed that agency emerges through context-dependent problem-solving strategies. Some learners relied on previous experiences and self-direction, whereas others benefited from external support; an issue that demonstrates the diversity of forms of agency in different sociocultural contexts.

Numerous empirical studies have also confirmed the relationship between agency and learning outcomes. Marta and Valvivo (2022), using Bandura's four main components of agency theory (intentionality, forethought, self-regulation, and self-efficacy), reported high levels of agency among Thai English as a foreign language learners, in which forethought and intentionality were more prominent. However, the overall correlation with language proficiency was moderate, indicating that teacher and peer support remain necessary for the continuation and deepening of agency.

He et al. (2024), in a study on peer review in Chinese university students' writing tasks, showed that learners exercise their agency through self-regulated learning and interaction with peers; an issue influenced by their beliefs, goals, and linguistic backgrounds. Teacher guidance was the most important external supportive factor, and time limitations were considered a common obstacle to the full manifestation of agency.

Task design also plays an important role in facilitating learner agency. Wu and Albert (2024) found that tasks that increase creative freedom and learner participation, such as the production of authentic content, create greater engagement compared with traditional and teacher-centered tasks. Interestingly, Hungarian learners reported greater participation than Chinese learners, emphasizing the role of cultural and contextual factors in the way agency is manifested.

Finally, agency becomes more evident in high-pressure or restrictive educational environments. Leo (2023) showed that learners and teachers in test-oriented educational systems, despite structural pressures, create spaces for meaningful participation by modifying teaching and learning practices. These findings indicate the flexibility and creativity inherent in agency even within strict frameworks.

2.2. Technology-Enhanced Learner Agency

The integration of technology into language learning environments has created new opportunities for fostering learner agency. Digital tools allow students to play a more active and autonomous role in shaping their own learning experiences. In classroom environments, Liu and Chao (2018) examined how a teacher in an English as a foreign language classroom in Taiwan used technological affordances, including mobile devices, online dictionaries, and interactive response systems, to encourage individual and collaborative forms of agency. Their findings showed that the success of technology integration depends not only on access to tools,

but also on teachers' ability to align these affordances with learners' goals and create opportunities for meaningful participation. They also emphasized that teacher agency plays a determining role in activating learner agency.

Beyond structured environments, technology has also been effective in supporting self-directed and autonomous learning (Heydari et al., 2019). Reinders and White (2016) reported that mobile applications, online games, and social networks provide opportunities for authentic language practice and enable learners to have greater control over their own progress. Brown (2017) also reported similar patterns among Taiwanese university students who used digital tools such as multiplayer games, video-sharing websites, and social networks for out-of-class learning. Many learners creatively adapted these tools to their individual goals and often preferred private and informal environments to avoid social judgment. Reinhardt (2022) extended this perspective and showed how learners pursue self-directed language learning outside the classroom through online games and multimedia platforms.

Task design plays a central role in shaping technology-assisted agency. Knight et al. (2017) examined two types of synchronous computer-mediated communication (SCMC) tasks, namely information-gap tasks and opinion-exchange tasks, and identified four types of agency (representational, organizational, strategic, and directive). Information-gap tasks promoted structured problem-solving and strategic agency, whereas opinion-exchange tasks facilitated personal expression and identity construction. These findings highlight the importance of purposeful design of technology-based activities for enhancing agency.

In addition to formal and informal learning spaces, informal digital environments known as "digital ecosystems" (Sauro & Zourou, 2019, p. 1) provide further opportunities for the flourishing of agency. Learners guide their linguistic development through interaction with social networks and video-sharing platforms. Zhai and Wibowo (2023), by examining artificial intelligence-based tools such as chatbots, showed that these technologies strengthen self-directed learning by providing rapid interactions.

Alqasham (2018), by analyzing Saudi EFL university learners' use of WhatsApp within van Lier's agency theory framework, also showed that this platform supports sustained language practice, social collaboration, and the development of autonomy. Learners transformed from passive recipients of content into active participants, demonstrating the dynamic role of social networking tools in contemporary language education.

Technology-based learning also supports authentic communication and intercultural development. Cohen and Hoffstetter (2017) showed that remote collaboration through lingua franca exchanges enables secondary school learners to take ownership of their learning. Students gained greater confidence by developing topics, participating in reality-based

dialogues, and employing communication strategies. These findings are consistent with the social constructivist approach and are particularly important for strengthening key skills, especially listening comprehension.

2.3. Technology-Enhanced Listening Comprehension Skill

In the past two decades, multimedia tools have contributed significantly to the improvement of listening comprehension in language education. Zhang and Xu (2022), in a review of 41 studies, showed that tools such as mobile devices, audio players, and subtitled videos support vocabulary development and grammatical awareness, and that the combination of sound and moving images is particularly effective for improving listening comprehension.

Mobile-assisted language learning has been a promising approach, although it has also been accompanied by challenges. Nah (2011) reported that Korean learners preferred Wireless Application Protocol (WAP)-based mobile tools due to their innovativeness and interactivity; however, high Internet costs and limited access prevented sustainable use. Alm (2013) showed that the use of podcasts combined with reflective blogging helped intermediate German learners strengthen their autonomy and listening strategies.

More recent innovations such as Mobile-Assisted Blended Learning (MABL) and virtual reality have also enhanced listening instruction. Pyo and Lee (2024) found that students who received mobile-assisted blended learning instruction demonstrated better performance than their counterparts in traditional classes and showed greater autonomy. Wang and Tai (2024) also highlighted the capacity of artificial intelligence-based personalization and showed that adaptive technologies create immersive listening environments that increase participation and comprehension.

Tai (2022), in examining the use of mobile virtual reality in English as a foreign language listening instruction, showed that learners who participated in virtual reality-based activities performed better than those receiving traditional video instruction and demonstrated higher levels of motivation, realism, and interactivity.

2.4. Metacognitive Awareness in Listening Comprehension

In second language listening instruction, three main approaches are emphasized: textual, inferential, and metacognitive strategies. While the first two approaches focus on decoding linguistic features and using contextual clues, metacognitive strategies address higher-level thinking and include planning, monitoring, and evaluating the listening process (Cross, 2015; Kobayashi, 2018; Vandergrift et al., 2006; Yildirim, 2017).

Goh and Singh (2013) showed that young learners demonstrate an emerging ability to reflect on and regulate their listening behaviors, although their self-awareness as listeners is still developing.

More recent findings indicate that learners with higher metacognitive awareness are better able to identify their strengths and weaknesses, adjust strategies, and improve their listening comprehension (Mohammadpour & Zafarghandi, 2024; Shaouji et al., 2024; Zhang & Xu, 2025). This combination of self-awareness (Siegel, 2013) and autonomy (Vandergrift, 2004) leads to the development of independent and effective listening habits.

Beyond general awareness, studies have also pointed to the role of metacognition in specific learning contexts. In the field of business English, and particularly in relation to listening anxiety, Zhang and Xu (2025) found that learners with higher self-efficacy demonstrated better performance, whereas those who experienced anxiety showed decreased comprehension; both outcomes were mediated through metacognitive regulation. Similarly, Su (2024) observed that learners with stronger metacognitive skills achieved higher performance, whereas learners with lower levels of language proficiency experienced greater anxiety and weaker regulation.

Numerous studies have also emphasized the role of metacognitive strategy instruction. Rahimi and Katal (2012) showed that planning, problem-solving, and evaluation strategies predicted learners' readiness to use digital listening tools. Mahdavi and Miri (2019) also demonstrated that reflective process-based approaches produced better outcomes in listening comprehension and metacognitive awareness compared with product-based approaches.

Other studies have confirmed these findings. Maftoon and Alamdari (2020) found that structured instruction significantly improved all five areas of the Metacognitive Awareness Listening Questionnaire (MALQ) and strengthened the importance of guided reflection and strategic listening. Moreover, Rubios and Bustos (2021), after implementing a metacognitive instructional cycle, reported significant increases in comprehension; although some subcomponents, such as directed attention and problem-solving, were not always consistent with comprehension outcomes.

Studies on low-proficiency learners have also reported similar results. Chou (2023) and Bozorgian et al. (2022) showed that explicit metacognitive instruction significantly improves these learners' listening scores and metacognitive awareness.

Overall, these studies highlight the central role of metacognitive awareness in second language listening success. This construct helps learners manage their listening process, cope with anxiety, and apply strategies effectively; an issue that becomes doubly important in technology-based learning environments.

3. Research Method

3.1. Research Design

This study was conducted mainly with a quantitative approach and based on a quasi-experimental pretest–posttest design with three groups. The aim of the quantitative section was

to examine the effect of technology-supported learner agency on listening comprehension and metacognitive awareness in listening among English as a foreign language learners. To enrich the interpretation of the quantitative findings and provide a deeper understanding of learners' experiences, semi-structured interviews were conducted with a number of participants from the technology-supported learner agency group at the end of the intervention. Therefore, the qualitative data in this study had a complementary and explanatory role and were used to interpret and enrich the quantitative findings. The independent variable was the type of instructional condition, which included: (a) technology-supported learner agency, (b) controlled use of technology, and (c) traditional textbook-based instruction (control group). The dependent variables were listening comprehension scores and metacognitive awareness in listening, which were measured through the pretest and posttest.

To ensure consistency and internal validity, several variables were controlled across the groups, including the number of sessions (12 sessions), the duration of each session (45 minutes), the thematic focus of the listening materials, and the total amount of listening exposure. In the technology-supported learner agency group, learners independently selected and managed their listening content from websites and YouTube, and this process was supported by an introductory strategy training session on using digital tools for autonomous listening. The controlled technology use group completed instructor-selected listening activities without learner choice, whereas the control group followed textbook-based listening activities. All groups engaged with listening materials that were thematically aligned.

In the qualitative phase, semi-structured interviews were used to examine the experiences of participants in the technology-supported learner agency group. This phase pursued three objectives: (a) identifying learners' preferences in selecting listening materials and technologies, (b) examining their perceptions of the benefits of agency for listening practice, and (c) identifying the challenges experienced during the intervention. This qualitative section complemented the quantitative data related to listening comprehension and metacognitive awareness in order to provide a comprehensive picture of the effects of technology-supported learner agency.

3.2. Participants

The participants of this study were 45 intermediate-level male English as a foreign language learners, aged between 14 and 17 years, with more than two years of experience in learning English in Mashhad. These learners were randomly assigned to three groups of 15 participants: Experimental Group 1 (controlled use of technology), Experimental Group 2 (technology-supported learner agency), and the control group. After administering the pretests, one participant from the controlled use of technology group withdrew from the study before the

beginning of the intervention, and the number of this group decreased to 14. Consequently, the final sample of the study consisted of 44 participants (controlled use of technology, n = 14; technology-supported learner agency, n = 15; control group, n = 15).

3.3. Research Instruments and Materials

3.3.1. Listening Comprehension Homogenization Test

To ensure that the participants were at the same level in terms of listening comprehension ability before the intervention, the listening section of the Oxford Placement Test (OPT) (Appendix A) was used. This test, developed by Oxford University Press, is considered one of the commonly used diagnostic and placement instruments in English as a foreign language and second language education contexts. The listening section of this test is aligned with the Common European Framework of Reference for Languages (CEFR) and assesses learners' ability to comprehend short interactions, monologues, and authentic listening situations.

This test includes various types of tasks, including answering multiple-choice questions based on short conversations, identifying key details in longer conversations, and selecting appropriate responses or summaries. These tasks reflect everyday listening situations and are designed to assess overall comprehension and listening accuracy. The Oxford Placement Test has been widely validated among learners with diverse backgrounds and demonstrates high internal consistency, with reliability coefficients reported between 0.85 and 0.90. The content validity of the test has been confirmed through its alignment with the criteria of the Common European Framework of Reference for Languages, and its construct validity has been confirmed through extensive field studies and precise statistical analyses (Oxford University Press, 2020).

3.3.2. Listening Comprehension Pretest and Posttest

The listening comprehension pretest (Appendix B) and posttest (Appendix C) used two different versions of the Cambridge Preliminary English Test (PET), which is designed by Cambridge English Language Assessment for intermediate-level learners (CEFR B1). This test is recognized as a valid assessment instrument due to its appropriate psychometric reliability and extensive application in English language education contexts. The internal consistency of this test has been reported as $\alpha = 0.83$, and its standard error of measurement has been reported as 6.49 on the Cambridge scale. The construct and content validity of the test have also been confirmed through its design based on the Common European Framework of Reference for Languages and extensive pilot administration among different learner populations.

Each version of the test consisted of four sections: (a) multiple-choice questions based on short audio files accompanied by pictures, (b) questions following monologues or short conversations, (c) note-completion tasks based on a longer listening text, and (d) comprehension questions related to a long monologue or interview. To reduce the practice

effect, two equivalent forms were used; one before the intervention to establish the baseline and the other after the intervention to measure improvement.

3.3.3. Metacognitive Awareness Listening Questionnaire (MALQ)

To measure learners' metacognitive awareness in listening, the Metacognitive Awareness Listening Questionnaire (MALQ) (Vandergrift et al., 2006) (Appendix D) was employed. This instrument consists of 21 items on a six-point Likert scale (1 = strongly disagree to 6 = strongly agree) and includes five subscales: planning/evaluation, directed attention, person knowledge, mental translation, and problem-solving. This questionnaire, which was developed within the theoretical framework of second language listening, has demonstrated acceptable internal consistency, and its Cronbach's alpha coefficients have been reported in validation studies between 0.68 (directed attention) and 0.78 (mental translation), with samples including 966 and 512 learners.

To ensure that the questionnaire was understandable and meaningful for Persian-speaking participants, its Persian version was prepared in collaboration with a professional translator, and a back-translation process was conducted to ensure semantic accuracy and consistency with the original version. The reliability of the Persian version was examined using pretest data, and Cronbach's alpha values ranging from 0.67 (person knowledge) to 0.80 (mental translation) were obtained, indicating moderate and acceptable internal reliability of the instrument in this context. The questionnaire was completed by all participants before and after the intervention.

3.3.4. Listening Tasks of the Control Group

The control group received 12 lessons from the intermediate-level book *Tactics for Listening* (Richards, 2011), which focused on skills such as listening for details and listening for opinions. The topics included travel and tourism, hobbies and interests, sports and physical activities, food and shopping, and customs and celebrations. These topics served as the basis for selecting thematically aligned listening materials for the two experimental groups so that thematic coverage remained consistent across all instructional conditions.

3.3.5. Listening Materials of the Controlled Use of Technology Group

The controlled use of technology group completed 12 listening activities selected by the instructor, which were extracted from websites and YouTube. These activities were presented by the first researcher in 12 sessions of 45 minutes and were thematically aligned with the book *Tactics for Listening*. Unlike the technology-supported learner agency group, participants in this group had no control over the selection of listening materials or playback and subtitle settings.

3.3.6. Listening Materials of the Technology-Supported Learner Agency Group

3.3.6.1. YouTube Videos

Participants in the technology-supported learner agency group independently selected YouTube videos related to five main topics (travel and tourism, hobbies and interests, sports and physical activities, food and shopping, and customs and celebrations). In a one-hour training session, the first researcher taught effective search methods using two sample videos and introduced strategies such as adjusting playback speed and optional use of English subtitles. To maximize learner agency, no restrictions were imposed on the length or difficulty level of videos, and learners were encouraged to select listening materials based on their individual goals and preferences.

3.3.6.2. Websites

Four free websites were made available for independent use by learners in the technology-supported learner agency group:

a) LearnEnglish (British Council),
b) Ello.org,
c) ESL Cyber Listening Lab, and
d) ESOL Courses.

These platforms were selected based on appropriate content for the intermediate level, the availability of audio and visual input, and the inclusion of accompanying exercises. The suitability of these websites was confirmed by two English language teaching experts (one holding a PhD degree and the other a PhD candidate with more than 10 years of teaching experience).

3.3.7. Semi-Structured Interview

To achieve the qualitative objectives of the study, semi-structured interviews were conducted by the first researcher with eight participants from the technology-supported learner agency group. These interviews were conducted in Persian (the participants' mother tongue), and each interview lasted 10 to 15 minutes. Learners had no time limitations in responding, and the interviewer used supportive techniques such as follow-up questions, paraphrasing, and creating pauses to encourage more complete responses. The responses were subsequently translated into English and prepared for coding and analysis.

The interview guide (Appendix E) included three open-ended questions. The first question concerned learners' preferred listening materials (website activities and YouTube videos) and the reasons for these preferences. The second question examined the extent to which freedom in selecting and managing listening activities was useful, and the third question investigated the challenges and limitations experienced during the intervention. These questions were designed

based on the theoretical framework of the study, and after review by two applied linguistics experts and pilot implementation, minor modifications were made to them. The resulting data provided rich and experience-based insights that complemented the quantitative findings related to listening comprehension and metacognitive awareness.

3.4. Implementation Procedure

To ensure the homogeneity of listening ability among the three groups, all participants first completed the listening section of the Oxford Placement Test. After that, participants were asked to complete the Metacognitive Awareness Listening Questionnaire online at home before the intervention. This questionnaire was administered through a Google Docs link one day before the first instructional session so that the baseline level of participants' metacognitive awareness could be clearly identified.

3.4.1. Technology-Supported Learner Agency Group

The technology-supported learner agency group began with a one-hour orientation session led by the first researcher. In this session, the four suggested websites (LearnEnglish, Ello.org, ESL Cyber Listening Lab, and ESOL Courses) as well as the YouTube platform were introduced as supporting tools for independent listening. Five instructional topics were also provided to guide learners' selection of appropriate content, and examples of YouTube videos were presented to teach effective searching.

As part of strategy training, learners became familiar with how to search, adjust playback speed, activate and deactivate subtitles, and replay audio and visual sections. No specific website or link was assigned obligatorily so that learners could search and practice according to their personal interests and goals.

After this training, participants in the technology-supported learner agency group independently completed 12 self-directed listening sessions over four weeks (three 45-minute sessions per week) at home. They had full control over the selection of listening materials and the way of practicing, and they sent brief daily reports (Appendix J) through Telegram to monitor the level of participation. These reports included the approximate duration of practice, the resources used, and a brief description of the activity completed, and they were used to monitor participants' engagement. In addition, regular reminders were provided throughout the period to maintain adherence to the practice schedule and the use of the introduced resources. However, due to the self-directed nature of the intervention, complete control over all activities outside the research environment and the possible use of additional resources was not possible.

3.4.2. Controlled Use of Technology Group

The controlled use of technology group also completed 12 sessions of 45 minutes over four weeks. These sessions were conducted before the formal class hours, during which learners

worked with listening materials selected by the instructor. The instructor introduced the instructional materials, guided the activities, and examined vocabulary and comprehension through purposeful pauses. Each session ended with structured comprehension activities and a final review.

3.4.3. Control Group

The control group also completed 12 sessions of 45 minutes over four weeks based on the book *Tactics for Listening* (Richards, 2011). These sessions were conducted by the second researcher, and the level of instructional support was equivalent to that of the controlled use of technology group.

3.4.4. Post-Intervention Activities

After the completion of the four-week intervention, all participants took the Cambridge PET listening posttest in person. Two days later, the Metacognitive Awareness Listening Questionnaire was completed online. In addition, to complete the quantitative data, semi-structured interviews were conducted with eight participants from the technology-supported learner agency group, and the obtained data were used for thematic analysis.

3.5. Data Analysis Method

3.5.1. Quantitative Data Analysis

Before conducting inferential analyses, preliminary examinations were carried out to ensure that the assumptions of parametric tests were met. Specifically, the assumptions of normality of data distribution, homogeneity of variances, and independence of observations were examined.

The normality of data distribution was assessed through examining skewness and kurtosis indices and also by observing histogram and Q-Q plots for the dependent variables (listening comprehension scores and metacognitive awareness). The results showed that the distribution of data in all three groups was approximately normal and that the assumption of normality was satisfied.

The assumption of homogeneity of variances was examined using Levene's test. The results of this test were not significant; therefore, the assumption of homogeneity of variances was confirmed. Furthermore, the assumption of independence of observations was ensured through the research design because participants were randomly assigned to three independent groups (technology-supported learner agency, controlled use of technology, and control group), and there was no overlap among their instructional conditions.

Considering that the assumptions of parametric tests were satisfied, one-way analysis of variance (One-way ANOVA) was used to compare the three groups in pretest and posttest scores of listening comprehension and metacognitive awareness. In cases where significant

differences were observed, Tukey's HSD post hoc test was used to determine pairwise differences among groups. All statistical analyses were conducted using SPSS software (version 2021).

3.5.2. Qualitative Data Analysis

The data obtained from the semi-structured interviews were analyzed using Braun and Clarke's (2006) thematic analysis method. Data analysis was conducted as a systematic and iterative process that began from the stage of data collection and was completed after the interviews were finished.

In the first stage, all interviews were fully transcribed after audio recording and were then translated from Persian into English. To reduce the possibility of meaning changes during the translation process, both Persian and English versions were examined in parallel. Subsequently, through repeated reading of the data, the researcher gained deep familiarity with the interview content and initial semantic patterns.

In the second stage, initial coding was conducted line by line. At this stage, meaning units related to learners' experiences of technology-based agency, the way they selected and used digital resources (YouTube and websites), and the challenges they experienced were extracted. Coding was conducted through a combination of an inductive approach and an approach guided by the theoretical framework of the study.

In the third stage, the initial codes were examined and organized into related semantic groups to form the initial categories of themes.

In the fourth stage, the initial themes were reviewed and refined to ensure that each theme represented a distinct yet coherent semantic pattern within the data. At this stage, some themes were merged or separated to achieve greater consistency with the raw data. Finally, the themes were defined and named, and three main themes were extracted, which are reported in the Results section.

To increase the trustworthiness of the qualitative findings, Lincoln and Guba's (1985) proposed criteria, including credibility, dependability, confirmability, and transferability, were considered throughout all stages of data analysis.

To strengthen credibility, interviews were conducted in a calm environment and without time limitations, and follow-up techniques such as additional questions, paraphrasing, and confirmation of responses by the interviewer were used. Moreover, to strengthen the consistency of the findings, the qualitative results were compared with the quantitative results (listening comprehension and metacognitive awareness), and data triangulation was used.

To increase dependability, all stages of the study, including data collection, transcription, translation, and analysis, were accurately and systematically documented to allow the analysis

process to be traced. In addition, to strengthen confirmability, data analysis was conducted recursively, and the extracted codes and themes were continuously compared with the raw data. Furthermore, analytical notes were maintained to record coding decisions and the process of changes.

Furthermore, to increase transferability, detailed descriptions of the research context, implementation conditions, and participant characteristics were provided so that the applicability of the findings in similar contexts could be evaluated.

4. Results

This section reports the quantitative and qualitative findings of the study. First, the results of the quantitative analyses are presented. In this section, after examining the initial homogeneity of the groups, within-group changes and between-group differences in the variables of listening comprehension and metacognitive awareness in listening are reported. Subsequently, the findings obtained from the thematic analysis of the interviews are presented to explain and complement the quantitative results.

4.1. Quantitative Results

In this section, prior to conducting the main analyses, the initial homogeneity of the groups in the research variables was examined. Then, the analyses focused on within-group changes (Section 4.1.1) and between-group differences (Section 4.1.2) for listening test scores and the results of the Metacognitive Awareness in Listening Questionnaire.

4.1.1. Group Homogeneity in the Pre-test

To ensure the initial homogeneity of the groups, pre-test scores of listening comprehension and metacognitive awareness were compared using one-way analysis of variance. The results showed that there was no significant difference among the three groups in the pre-test scores of listening comprehension, $F(2,41)=0.13$, $p=0.880$. Similarly, no significant difference was observed in the pre-test scores of metacognitive awareness, $F(2,40)=0.19$, $p=0.829$. These findings indicate that the groups were homogeneous in terms of the examined variables before the implementation of the intervention. Therefore, the observed differences in the post-test can be attributed with greater confidence to the effect of the intervention rather than to initial differences among the groups.

4.1.2. Within-group Analysis

Within-group analyses were conducted to evaluate the effectiveness of each of the interventions. For listening comprehension, descriptive statistics and paired-samples t-tests were used to examine changes. For metacognitive awareness, responses to the 21-item questionnaire were organized into five subscales, including planning/evaluation, directed

attention, person knowledge, mental translation, and problem-solving. Paired-samples t-tests were conducted for each subscale, and the effect size was calculated using Cohen's d.

4.1.2.1. Listening Comprehension Tests

The descriptive statistics of the pre-test and post-test listening test scores for the three groups are presented in Table 1.

Table 1. Descriptive Statistics for Pretest and Posttest Listening Scores by Group

Group	n	Pretest M (SD)	Posttest M (SD)	t(df)	p	Cohen's d
TALA	15	19.87 (2.23)	22.80 (1.42)	6.91 (14)	<.001	1.58
Controlled technology use	14	19.79 (2.12)	22.79 (2.12)	8.01 (13)	<.001	1.42
Control	15	20.07 (2.49)	21.47 (2.03)	4.33 (14)	.001	0.61

The results of the paired-samples t-test showed that the TALA group had a significant increase in listening comprehension scores from the pre-test to the post-test (Table 1). The effect size was also large, indicating the high strength of the intervention. Similarly, the mean scores of the controlled technology use group increased from the pre-test to the post-test. In contrast, the control group showed a more limited increase from 20.07 to 21.47.

4.1.2.2. Metacognitive Awareness in Listening Questionnaire

For metacognitive awareness (Table 2), the three groups showed different patterns of changes in strategies from the pre-test to the post-test depending on the type of instructional approach they received.

Table 2. Within-Group Comparisons for Metacognitive Awareness Questionnaire

Group	Subscale	Pretest M (SD)	Posttest M (SD)	t(df)	p	Cohen's d
TALA	Planning/Evaluation	10.20 (2.65)	17.47 (2.26)	10.52 (14)	<.001	2.94
	Directed Attention	11.20 (2.31)	16.40 (1.76)	8.84 (14)	<.001	2.50
	Person Knowledge	12.60 (2.03)	8.13 (1.92)	-8.62 (14)	<.001	2.26
	Mental Translation	12.60 (2.13)	7.60 (2.06)	8.79 (14)	<.001	2.39
	Problem-Solving	15.40 (2.47)	22.47 (2.33)	12.07 (14)	<.001	2.94

Group	Subscale	Pretest M (SD)	Posttest M (SD)	t(df)	p	Cohen's d
Controlled technology use	Planning/Evaluation	10.71 (2.97)	12.71 (2.33)	3.68 (13)	.003	0.75
	Directed Attention	11.86 (2.51)	13.36 (2.34)	3.04 (13)	.009	0.62
	Person Knowledge	11.86 (2.41)	11.64 (2.34)	-0.48 (13)	.641	0.09
	Mental Translation	11.86 (2.25)	10.50 (2.03)	2.97 (13)	.011	0.63
	Problem-Solving	16.71 (2.97)	18.64 (2.82)	3.89 (13)	.002	0.67
Control	Planning/Evaluation	11.00 (2.42)	12.47 (2.10)	4.09 (14)	<.001	0.65
	Directed Attention	11.40 (2.06)	12.07 (1.91)	1.97 (14)	.069	0.34
	Person Knowledge	11.93 (2.12)	11.93 (2.19)	0.00 (14)	1.00	0.00
	Mental Translation	11.67 (2.16)	10.40 (1.80)	2.94 (14)	.011	0.65
	Problem-Solving	16.60 (2.77)	18.07 (2.60)	3.12 (14)	.008	0.55

Note. Lower scores on Person Knowledge and Mental Translation reflect improvements.

As shown in Table 2, the TALA group showed significant improvement in all subscales. The scores of planning/evaluation increased from 10.20 to 17.47, directed attention from 11.20 to 16.40, and problem-solving from 15.40 to 22.47. In addition, learners' reliance on mental translation decreased from 12.60 to 7.60. The results of the paired-samples t-tests showed that the controlled technology use group also experienced significant improvement in some subscales, although the extent of these changes was lower than that of the TALA group. In contrast, the control group showed only slight changes, which were not statistically significant in most cases.

4.1.3. Between-group Analysis

To compare the gain scores (the difference between post-test and pre-test scores) among the groups for both variables of listening comprehension and metacognitive awareness in listening, one-way analysis of variance (ANOVA) was used. Since the results of the one-way analysis of

variance were significant for some variables, Tukey's HSD post hoc test was conducted to determine the exact location of between-group differences.

4.1.3.1. Listening Comprehension Tests

For listening comprehension (Table 3), a significant difference was observed among the groups' gain scores:

Table 3. Between-Group Comparisons of Listening Comprehension Gain Scores

Group	n	Gain Score M (SD)	Post-Hoc (Tukey)
TALA	15	2.93 (1.62)	TALA > Control
Controlled technology use	14	3.00 (1.41)	Controlled technology use > Control
Control	15	1.40 (1.24)	TALA vs Controlled technology use: ns (not sig)

Note. Gain scores represent posttest minus pretest listening comprehension scores. One-way ANOVA: $F(2, 41) = 6.18$, $p = .005$, partial $\eta^2 = .23$ (moderate effect).

The results of the post hoc test showed that both the TALA and controlled technology use groups performed better than the control group, while no significant difference was observed between these two groups.

4.1.3.2. Metacognitive Awareness in Listening Questionnaire

In the post-test (Table 4), the groups showed different and significant patterns in metacognitive awareness strategies.

Table 4. Between-Group Comparisons at Posttest for Questionnaire

Subscale	TALA M SD)	Controlled technology use M (SD)	Control M (SD)	F(2,41)	p	Post-Hoc (Tukey)
Planning/Evaluation	17.47 (2.26)	12.71 (2.33)	12.47 (2.10)	23.81	<.001	TALA > Controlled technology use, Control
Directed Attention	16.40 (1.76)	13.36 (2.34)	12.07 (1.91)	19.63	<.001	TALA > Controlled technology use > Control
Person Knowledge	8.13 (1.92)	11.64 (2.34)	11.93 (2.19)	18.42	<.001	Control, Controlled technology use > TALA
Mental Translation	7.60 (2.06)	10.50 (2.03)	10.40 (1.80)	13.27	<.001	Control, Controlled technology use > TALA

Subscale	**TALA M SD)**	**Controlled technology use M (SD)**	**Control M (SD)**	**F(2,41)**	**p**	**Post-Hoc (Tukey)**
Problem-Solving	22.47 (2.33)	18.64 (2.82)	18.07 (2.60)	28.94	<.001	TALA > Controlled technology use, Control

Note. Total n = 44

The TALA group performed significantly better than the other two groups in planning, directed attention, and problem-solving, and also reported less reliance on mental translation. These findings indicate that the observed difference was not merely due to the use of technology; rather, learners' agency in selecting, managing, and regulating learning activities played an important role in the development of metacognitive strategies.

4.2. Qualitative Results

The data obtained from the semi-structured interviews were analyzed using Braun and Clarke's (2006) thematic analysis. As a result of this process, three main themes were extracted, which were aligned with the objectives of the study and the interview questions: (a) preferences regarding listening materials, (b) perceived benefits of agency in listening practice, and (c) technological and implementation challenges. In the following, each of these themes is presented along with sample quotations.

4.2.1. Preferences Regarding Listening Materials

Participants reported diverse preferences between YouTube videos and website-based listening activities and considered each of these resources valuable for different reasons. Six out of the eight participants preferred YouTube and identified its engaging and authentic content as the main reason for this choice. One learner stated:

"I liked YouTube because it was interesting and I could listen to real English, like movies, and replay the more difficult parts."

Features such as the ability to control playback speed, use subtitles, and access a wide variety of video topics had improved their listening experience. In contrast, five participants preferred website-based activities because of their structured nature and similarity to exam practices. One learner explained:

"Websites helped me improve my skills through exercises similar to exams."

Notably, many learners used both resources strategically; they used YouTube for more enjoyable and immersive practice and relied on websites for targeted skill development. This pattern indicates that learners used digital resources in a complementary and purposeful manner, and their choices were not based solely on content attractiveness but were also consistent with their learning goals.

4.2.2. Perceived Benefits of Agency in Listening Practice

All participants reported that having freedom in selecting listening materials was a very important advantage for them. They emphasized that this autonomy allowed them to adjust their learning according to their personal interests and preferred learning styles. One learner stated:

"I could focus on things I liked and spend more time on activities that were interesting for me."

Another participant stated:

"Being able to choose my favorite videos and use subtitles when needed was very helpful and improved my listening a lot."

Several learners mentioned that this sense of control encouraged them to practice more frequently and use strategies such as adjusting playback speed and turning subtitles on or off according to the difficulty level of the materials. These findings indicate that learner agency not only increases motivation but also leads to the conscious use of metacognitive strategies.

These findings are consistent with the theoretical perspectives of the study and show that choice and management of learning activities can strengthen self-regulation, intrinsic motivation, and the conscious use of metacognitive strategies.

4.2.3. Technological and Implementation Challenges

Despite the advantages of using digital tools, most participants reported encountering technological barriers during the intervention. Seven out of the eight participants referred to problems such as low internet speed and difficulties accessing VPN, especially when using YouTube. One learner stated:

"Low internet speed and VPN disconnection made watching videos difficult."

Others also considered finding suitable listening materials challenging. One participant explained:

"Finding a suitable video took time, and some of them were too difficult for my level."

Several learners also mentioned that unrelated recommended content on YouTube sometimes caused distraction and reduced concentration. One of them said:

"Sometimes I got distracted by watching other videos and did not realize how much time had passed."

However, participants were often able to manage their learning process by adapting to these challenges, for example, by turning to website-based activities when technical problems occurred. This indicates learners' flexibility in regulating the learning environment and exercising agency under limiting conditions. Despite these limitations, learners' ability to adapt to circumstances and find alternative solutions suggests that learner agency can continue even when facing technological barriers.

5. Discussion and Conclusion

This study investigated the impact of TALA on EFL learners' listening comprehension and metacognitive awareness in listening, comparing it with Controlled Technology Use (CTU) and traditional textbook-based instruction. Overall, the findings indicated that digitally engaged learning directed by learners themselves resulted in more significant improvements in listening comprehension skills and strategic learning behaviors compared with the other two approaches. Although Controlled Technology Use was also more effective than traditional textbook-based instruction, the extent and depth of improvement observed in the TALA group appeared to be more substantial and sustained.

In response to the first research question, the findings demonstrated that both experimental groups significantly outperformed the textbook-based instruction group, highlighting the potential of digital tools in enhancing listening comprehension. More active engagement with listening input, increased opportunities for practice, and access to diverse learning resources were among the factors that may explain these improvements. These findings are consistent with Zhang and Xu's (2022) findings regarding the benefits of multimedia-based input and further support Piao and Li's (2024) concerns regarding the limitations of traditional approaches in digitally oriented learning environments. From a theoretical perspective, Larsen-Freeman's (2019) Complex Dynamic Systems Theory (CDST) explains these findings as the outcome of dynamic interactions among learners, learning contexts, and technological tools, an interaction that becomes richer and more flexible within a TALA approach.

Regarding the second research question, the findings revealed that the TALA group demonstrated significantly greater development in planning, directed attention, and strategy regulation compared with the other groups. While Controlled Technology Use resulted in increased practice and some improvement in performance, this development appeared to be primarily procedural and less likely to involve the reflective internalization of strategies. These results are consistent with Vandergrift et al.'s (2006) findings regarding the importance of strategic listening instruction and support Maftoon and Alamdari's (2020) argument that metacognitive development depends on active engagement and learner control over the learning process. Furthermore, these findings can be interpreted through Bandura's (2001) Social Cognitive Theory, in which self-efficacy and perceived personal control facilitate effective strategy use. Additionally, Self-Determination Theory (Deci & Ryan, 1985) suggests that experiences of autonomy and competence enhance intrinsic motivation and contribute to sustained learning, a pattern clearly observed in the performance of the TALA group.

In response to the third research question, the qualitative findings revealed that learners in the TALA group considered the opportunity to choose among platforms such as YouTube and

English language learning websites a key factor in maintaining motivation and sustaining engagement. Flexibility in selecting content, adjusting the pace of learning, and personalizing listening practices strengthened learners' sense of ownership over their learning. These findings are consistent with Piccardo and North's (2023) and Knight et al.'s (2017) studies, which identified the alignment between technology and learners' interests as a determining factor in increasing motivation. In contrast, the limited choice available to learners in the Controlled Technology Use group provided fewer opportunities for the development of personalized strategies, which corresponds with Liu and Chao's (2018) warning regarding reduced learner agency in fully teacher-directed approaches. Furthermore, the adaptive behaviors demonstrated by TALA learners, such as changing platforms or adjusting playback speed when encountering unstable internet connections, reflect action-oriented independence, which Reinders and White (2016) and Teng (2019) identify as a central component of learner agency.

Overall, the findings indicate that although structured exposure to technology can enhance listening comprehension, integrating learner agency produces additional benefits for both listening performance and metacognitive development. Learners in the TALA group not only demonstrated stronger performance but also internalized self-regulatory habits and strategic reflection, which are essential for long-term learning. This dual impact is consistent with Complex Dynamic Systems Theory, Vygotsky's (1978) Sociocultural Theory regarding the mediating role of tools within the Zone of Proximal Development, and Self-Determination Theory's emphasis on the motivational power of autonomy and competence.

From a practical perspective, the findings of this study highlight the need to reconsider approaches to listening instruction in EFL contexts. Even a limited degree of learner choice and control may generate outcomes approaching those achieved through TALA. Teachers can establish a balance between instructional guidance and opportunities for exploration, thereby creating a connection between formal classroom instruction and informal digital learning (Sauro & Zourou, 2019). Incorporating agency-oriented components into curricula and teacher education programs may enhance the effectiveness of listening instruction in increasingly digital learning environments.

From a theoretical perspective, the novelty of this study lies in conceptualizing TALA as an integrated construct that connects the cognitive, metacognitive, and motivational dimensions of language learning. Whereas previous studies have primarily examined the effects of technology, metacognitive strategy instruction, or learner autonomy separately, the present study demonstrates that the purposeful combination of choice, control, and technological engagement can function as a mediating mechanism that facilitates simultaneous development in listening comprehension and metacognitive awareness. From the perspective of Complex

Dynamic Systems Theory, these findings suggest that listening development emerges from the dynamic interaction among learners, technology, and the learning environment. Moreover, within the framework of Sociocultural Theory, technology is not merely a tool for content delivery; rather, it functions as a mediating artifact that expands learning opportunities and facilitates active learner participation. From the perspective of Social Cognitive Theory, increased self-efficacy and perceived control over the learning process can lead to more effective use of listening and metacognitive strategies. Finally, Self-Determination Theory explains how increased autonomy and opportunities for choice strengthened learners' intrinsic motivation. Therefore, the findings of the present study provide empirical evidence for integrating these theoretical perspectives in explaining language learning within digital environments.

However, this study was subject to several limitations. The relatively small sample size (n = 44), focus on a single educational context, and short intervention period of four weeks limit the generalizability of the findings. Furthermore, technical barriers, such as unstable internet access, may have influenced learners' learning experiences. In addition, because the participants were intermediate-level learners, the findings may not necessarily be applicable to learners at other proficiency levels. Moreover, since part of the TALA intervention was conducted in a self-directed manner outside the classroom, complete control over learners' total exposure time to listening materials and their possible use of additional resources was not possible, although regular activity reports were used to monitor participation. Future studies could employ larger and more diverse samples, longitudinal designs, and learners from different proficiency levels to provide a more comprehensive understanding of the long-term effects of TALA. Furthermore, incorporating artificial intelligence-supported tools (Zhai & Wibowo, 2023) may help reduce access-related barriers and further strengthen learner agency, particularly in under-resourced contexts.

Overall, the evidence from this study suggests that TALA provides an effective and sustainable framework for enhancing listening comprehension and metacognitive awareness in EFL education. This framework is also aligned with the ongoing digital transformation of contemporary language education.

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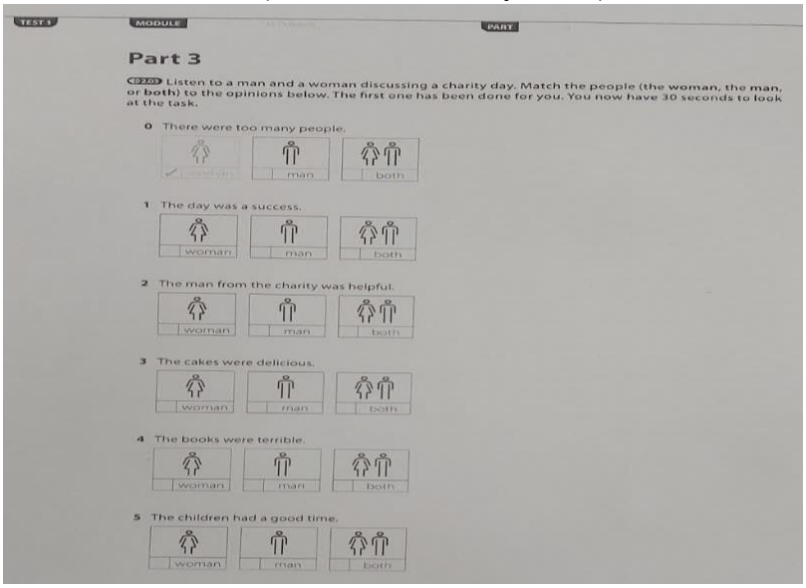
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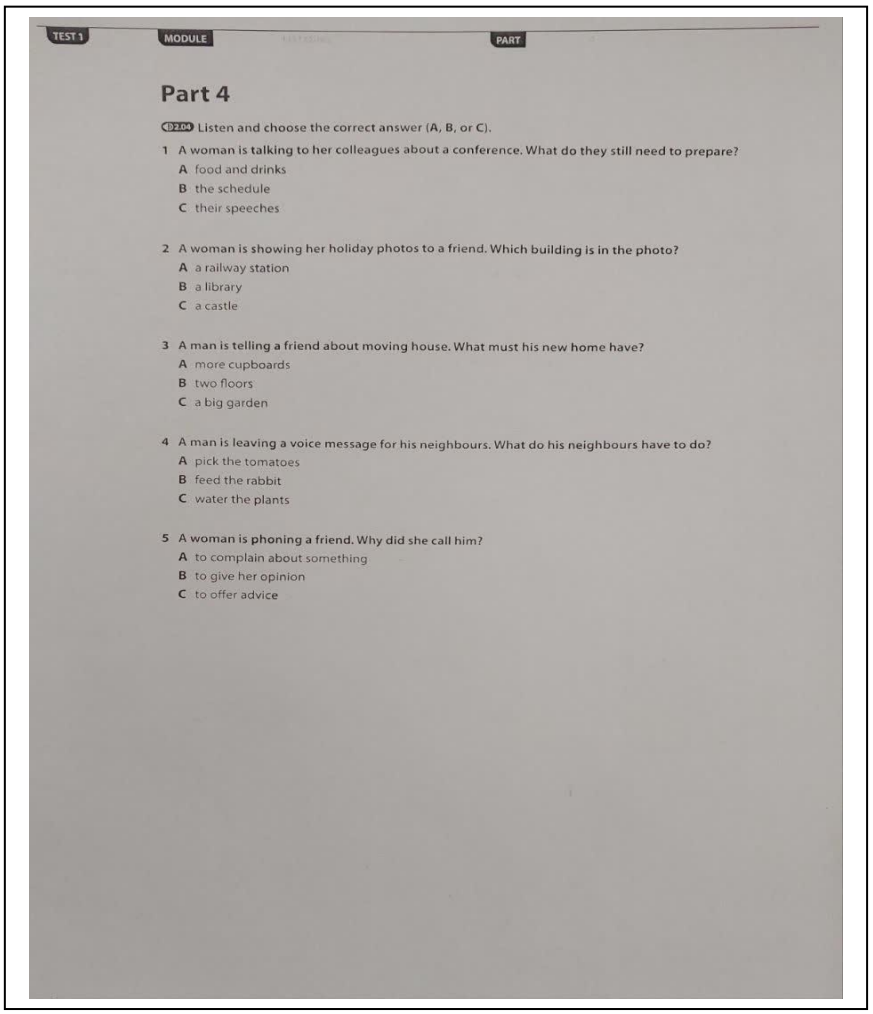
Appendices

Appendix A.

The Listening section of the Oxford Placement Test (OPT)

(Oxford University Press)





TEST 1 MODULE PART

Part 4

2.04 Listen and choose the correct answer (A, B, or C).

1 A woman is talking to her colleagues about a conference. What do they still need to prepare?
A food and drinks
B the schedule
C their speeches

2 A woman is showing her holiday photos to a friend. Which building is in the photo?
A a railway station
B a library
C a castle

3 A man is telling a friend about moving house. What must his new home have?
A more cupboards
B two floors
C a big garden

4 A man is leaving a voice message for his neighbours. What do his neighbours have to do?
A pick the tomatoes
B feed the rabbit
C water the plants

5 A woman is phoning a friend. Why did she call him?
A to complain about something
B to give her opinion
C to offer advice

Appendix B.

Listening Comprehension Pre-test. Cambridge English: Preliminary (PET) Listening Test (CEFR B1)

Part 2

Questions 8 – 13

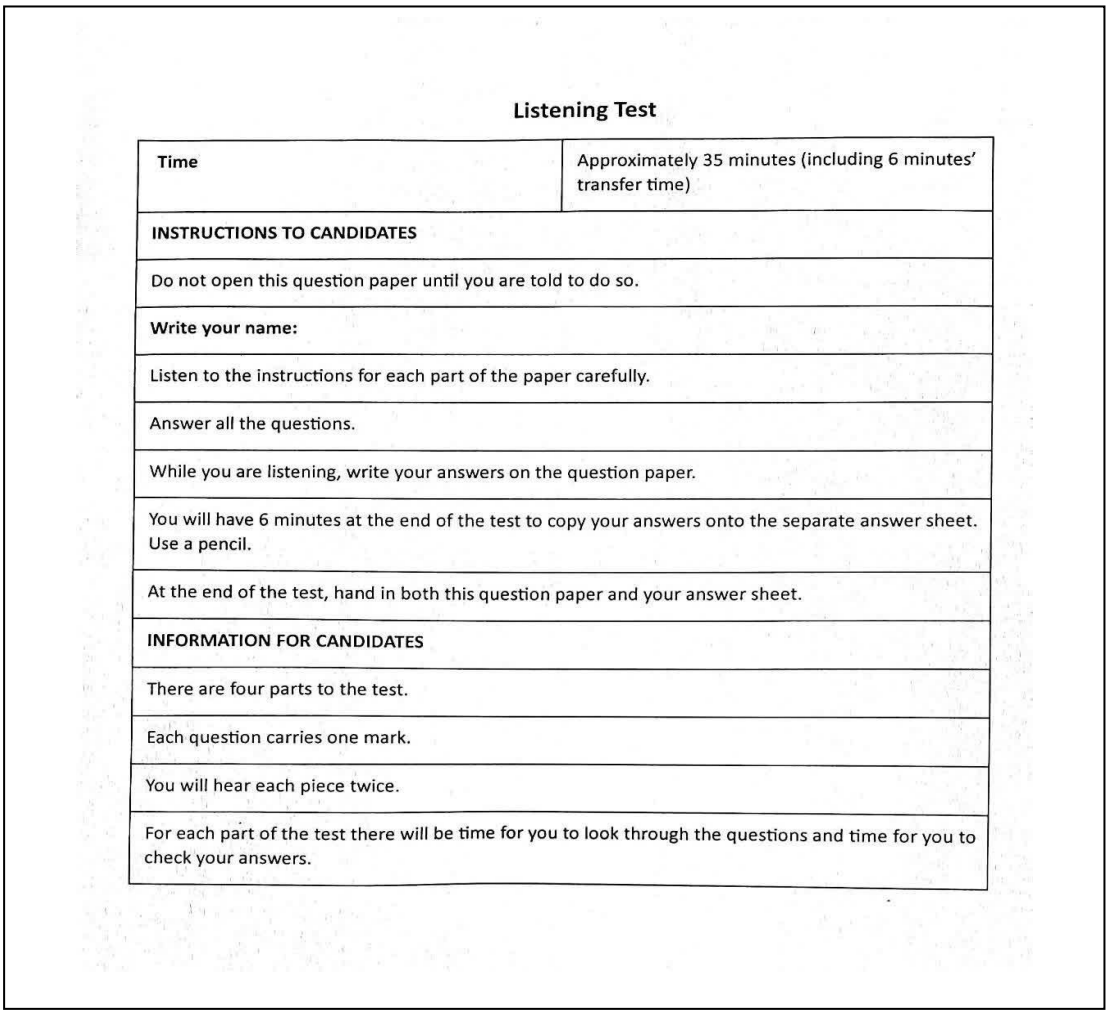
For each question, choose the correct answer.

8 You will hear two friends talking about a campsite they have been to.
What did the boy like best about it?
A It was very close to the beach.
B There were lots of people his age.
C The activities were free.

9 You will hear two friends talking about homework.
The girl thinks that doing homework with friends
A is fun.
B helps concentration.
C takes longer than doing it alone.

10 You will hear a boy telling his friend about a rock-climbing trip.
How did he feel about it?
A grateful for the help he got
B satisfied with his climbing
C hopeful of going again

11 You will hear two friends talking about learning to play the guitar.
The girl advises the boy to
A practise more often.
B play in a variety of styles.
C listen to the best guitarists.



Listening Test

Time	Approximately 35 minutes (including 6 minutes' transfer time)
INSTRUCTIONS TO CANDIDATES	
Do not open this question paper until you are told to do so.	
Write your name:	
Listen to the instructions for each part of the paper carefully.	
Answer all the questions.	
While you are listening, write your answers on the question paper.	
You will have 6 minutes at the end of the test to copy your answers onto the separate answer sheet. Use a pencil.	
At the end of the test, hand in both this question paper and your answer sheet.	
INFORMATION FOR CANDIDATES	
There are four parts to the test.	
Each question carries one mark.	
You will hear each piece twice.	
For each part of the test there will be time for you to look through the questions and time for you to check your answers.	

Appendix C.

Listening Comprehension Post-test. Cambridge English: Preliminary (PET) Listening Test (CEFR B1)

Part 3

Questions 14 – 19

For each question, write the correct answer in the gap. Write **one** or **two words** or a **number** or a **date** or a **time.**

You will hear a radio presenter called Anita talking about her holiday in Cuba.

ANITA'S HOLIDAY IN CUBA:

In the National Gardens, the **(14)** .....was the thing that attracted most people.

On the swimming trip, electronic armbands kept the **(15)** .....away.

On the day in the countryside, Anita almost fell off a **(16)** .....

In the capital city, Anita saw a **(17)** .....in a theatre.

Anita enjoyed visiting a farm where **(18)** .....is produced.

Anita bought some **(19)** .....as gifts.

Part 4

Questions 20 – 25

For each question, choose the correct answer.

You will hear an interview with a woman called Vicky Prince, a champion swimmer who now works as a swimming coach.

20 Vicky first went in for competitions because

A she had joined a swimming club.
B her parents were keen on swimming.
C her swimming teacher encouraged her.

21 As a teenager, Vicky's training involved

A exercising on land as well as in the water.
B going without meals during the day.
C travelling to a pool once a day.

22 What did Vicky find hard about her training programme?

A She couldn't go on school trips.
B She lost some of her friends.
C She missed lots of parties.

23 What helped Vicky to do well in the national finals?

A She was not expected to win.
B She trained harder than usual.
C She wanted to take a cup home.

24 As a swimming coach, Vicky thinks she's best at teaching people

A to deal with failure.
B to improve their technique.
C to get swimming qualifications.

25 Why has Vicky started doing long-distance swimming?

A She needed to get fit again.
B She thought it would be fun.
C She wanted to do some travelling.

Appendix D.

Metacognitive Awareness in Listening Comprehension Questionnaire (MALQ) (Vandergrift et al., 2006)

Metacognitive Awareness Listening Questionnaire (MALQ)

Type scale	Strategy or belief/perception						
Planning-evaluation	1. Before I start to listen, I have a plan in my head for how I am going to listen.	1	2	3	4	5	6
Directed attention	2. I focus harder on the text when I have trouble understanding.	1	2	3	4	5	6
Person knowledge	3. I find that listening in French is more difficult than reading, speaking, or writing in French.	1	2	3	4	5	6
Mental translation	4. I translate in my head as I listen.	1	2	3	4	5	6
Problem-solving	5. I use the words I understand to guess the meaning of the words I don't understand.	1	2	3	4	5	6
Directed attention	6. When my mind wanders, I recover my concentration right away.	1	2	3	4	5	6
Problem-solving	7. As I listen, I compare what I understand with what I know about the topic.	1	2	3	4	5	6
Person knowledge	8. I feel that listening comprehension in French is a challenge for me.	1	2	3	4	5	6
Problem-solving	9. I use my experience and knowledge to help me understand.	1	2	3	4	5	6
Planning/evaluation	10. Before listening, I think of similar texts that I may have listened to.	1	2	3	4	5	6
Mental translation	11. I translate key words as I listen.	1	2	3	4	5	6
Directed attention	12. I try to get back on track when I lose concentration.	1	2	3	4	5	6
Problem-solving	13. As I listen, I quickly adjust my interpretation if I realize that it is not correct.	1	2	3	4	5	6
Planning/evaluation	14. After listening, I think back to how I listened, and about what I might do differently next time.	1	2	3	4	5	6
Person knowledge	15. I don't feel nervous when I listen to French.	1	2	3	4	5	6
Directed attention	16. When I have difficulty understanding what I hear, I give up and stop listening.	1	2	3	4	5	6
Problem-solving	17. I use the general idea of the text to help me guess the meaning of the words that I don't understand.	1	2	3	4	5	6
Mental translation	18. I translate word by word, as I listen.	1	2	3	4	5	6
Problem-solving	19. When I guess the meaning of a word, I think back to everything else that I have heard, to see if my guess makes sense.	1	2	3	4	5	6
Planning/evaluation	20. As I listen, I periodically ask myself if I am satisfied with my level of comprehension.	1	2	3	4	5	6
Planning/evaluation	21. I have a goal in mind as I listen.	1	2	3	4	5	6

Appendix E

Semi-Structured Interview Guide

The following open-ended questions were used to explore participants' experiences with Technology-Assisted Learner Agency (TALA):

1. What listening materials (e.g., website activities, YouTube videos) did you prefer, and why?
2. How useful was the freedom to choose and manage your listening activities?
3. What challenges or limitations did you encounter during the intervention?

Appendix F.

The TALA Participants' Report Transcript (Telegram)

In recent


HB
Hosein Bakhoda
last seen recently
YouTube 30min
Website 5min 00:03
Hi,ok 00:03
December 4, 2023
Don't forget to report.. 18:06
YouTube 20min
Website 10min 20:22
Ok 23:57
December 7, 2023
Don't forget to report.. 00:12
YouTube 35min
Website 0min 00:35
Ok 08:42
December 9, 2023
YouTube 25min
Website 10min 19:53
Ok 21:32
December 11, 2023
Don't forget to report.. 21:42
Message