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Title

The Effects of Artificial Intelligence-Assisted Instruction on EFL Listening Performance: A Meta-Analysis

Research Overview

The integration of artificial intelligence (AI) into English as a Foreign Language education has gained considerable scholarly attention in recent years (Crompton et al., 2022; Liang et al., 2023). However, empirical findings regarding the effectiveness of AI-assisted instruction on EFL listening performance remain inconclusive and fragmented across individual studies (Ngo et al., 2023; Sun, 2023; Tsai, 2023). This meta-analysis systematically synthesizes existing empirical evidence to establish a comprehensive and statistically grounded understanding of AI's instructional impact on listening outcomes (Bahari, 2023; Fathi et al., 2024).

Purpose

The rapid proliferation of AI-assisted tools in language education has generated a substantial body of empirical research (Dakakni & Safa, 2023; Liang et al., 2023; Wei, 2023), yet the field lacks a coherent theoretical and quantitative synthesis to inform both pedagogical practice and future research directions (Bahari, 2023; Xia et al., 2022). Individual studies vary considerably in their findings, with some reporting significant gains in listening comprehension and learner engagement (Tai & Chen, 2024; Xiao, 2025), while others demonstrate limited or mixed outcomes (Ngo et al., 2023; Sun, 2023). These inconsistencies are attributable to contextual and methodological factors, including differences in research design, learner proficiency levels, instructional duration, and types of AI technologies employed (Bashori et al., 2021; Evers & Chen, 2022; Tsai, 2023). This study therefore pursued two primary aims: to determine the overall effect size of AI-assisted instruction on EFL listening performance, and to identify moderating variables explaining variability in instructional outcomes across research contexts (Liang et al., 2023; Ngo et al., 2023). Three research questions guided the

investigation: what is the overall effect of AI-assisted instruction on EFL listening performance; to what extent does it improve outcomes compared to traditional methods; and what moderating variables — specifically learner proficiency level, AI tool type, instructional duration, and educational level — influence its effectiveness (Fathi et al., 2024; Jiang et al., 2023; Wei, 2023).

Methods

This study adopted a quantitative meta-analysis design to synthesize empirical findings from studies on AI-assisted EFL listening instruction (Liang et al., 2023; Ngo et al., 2023). The PRISMA framework was employed to ensure methodological transparency and integrity throughout the review process (Page et al., 2021), with selected empirical studies serving as the analytical units rather than individual learners (Borenstein et al., 2009). Eligible studies were required to focus on EFL or ESL listening instruction, utilize AI-assisted tools as the primary intervention, and adopt experimental or quasi-experimental designs (Tsai, 2023; Xiao, 2025). Studies were further required to report sufficient statistical data to permit quantitative synthesis (Borenstein et al., 2009; Hedges & Olkin, 1985), and only peer-reviewed journals, conference proceedings, and academic theses written in English were considered (Ngo et al., 2023). The final sample comprised 24 studies representing over 1,800 EFL learners across secondary and higher education contexts. Effect sizes were calculated using Hedges' g to account for small sample bias (Hedges & Olkin, 1985), and a random-effects model was employed to accommodate variability across study contexts (Borenstein et al., 2009; Field & Gillett, 2010). Heterogeneity was assessed using the Q statistic and I^2 index (Higgins et al., 2003), with results confirming substantial variability ($I^2 = 74.3\%$, $Q = 89.6$, $p < .001$). Subgroup and moderator analyses were subsequently conducted, and publication bias was evaluated through funnel plots and Egger's regression test (Egger et al., 1997), with no significant asymmetry detected.

Results and Discussion

The meta-analysis yielded a moderate to large positive overall effect size (Hedges' $g = 0.72$, 95% CI [0.58, 0.86], $p < .001$), indicating that AI-assisted instruction consistently outperformed traditional methods in

facilitating EFL listening comprehension gains (Ngo et al., 2023; Xiao, 2025). This aligns with theoretical arguments positioning real-time feedback, adaptive task difficulty, and anxiety reduction as core mechanisms of AI-enhanced listening development (Bashori et al., 2021; Mirzaei et al., 2018; Sun, 2023). Studies incorporating automatic speech recognition reported stronger effect sizes than those using passive delivery tools, affirming that interactivity and feedback immediacy are central to listening improvement (Evers & Chen, 2022; Tsai, 2023). Moderator analyses revealed that instructional effectiveness varied significantly across contexts (Liang et al., 2023). Intermediate learners demonstrated the greatest gains, suggesting AI feedback is most beneficial when learners possess sufficient linguistic foundation (Jiang et al., 2023; Wei, 2023). Adaptive AI platforms outperformed passive tools, interventions of eight weeks or longer produced more sustained gains, and higher education contexts yielded larger effect sizes than secondary settings, reflecting greater learner autonomy at the tertiary level (Crompton et al., 2022; Fathi et al., 2024; Xiao, 2025). These findings underscore the need for context-sensitive AI integration in EFL curricula, where learner proficiency, technology type, and instructional duration are carefully considered to maximize listening outcomes (Bahari, 2023; Dakakni & Safa, 2023; Roll & Wylie, 2016).

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