

Enhancing EFL learners' connected speech processes through music

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Abstract

Native speakers of English tend to exhibit a highly effective articulation pattern during speech production. This phenomenon results in the flow of linguistic units within a speech continuum, where words are interconnected without clear boundaries between them. Concurrently, various linguistic and articulatory simplifications occur, accompanied by processes characteristic of connected speech. These processes encompass, but are not limited to, sentence stress and rhythm, reduction, elision, intrusion, assimilation, linking, liaison, among others. Scholars often advocate for the integration of authentic connected speech into English as a Foreign Language (EFL) curriculum. Such integration not only facilitates the attainment of a native-like pronunciation by EFL learners but also enhances their comprehensibility and linguistic acumen. Accordingly, a spectrum of pedagogical techniques and approaches has been proposed in EFL instruction to cultivate students' proficiency in producing and comprehending natural connected speech, with music being among the most effective. In addition to music's inherent relaxation benefits in EFL pedagogy, it nurtures learners' rhythmic and melodic sensibilities, heightens their awareness of specific (foreign) sounds, and facilitates bilateral hemispheric engagement in the brain, thus fostering improved information retention. Furthermore, singing entails the temporal overlap of successive phonetic segments, creating a continuous stream of sound and requiring meticulous word linking, thereby promoting the natural acquisition of connected speech. This study aims to investigate the impact of musical activities on the development of connected speech production skills among university-level EFL students. A quasi-experimental methodology was employed, involving 48 first-year English Philology students at Vilnius University, all of whom were native Lithuanian speakers with at least B2-level English proficiency. The control group received traditional text-based instruction, while the test group engaged in singing-based training, designed to enhance the natural acquisition of connected speech features. The study was conducted over three phases: a pre-test, a post-test following the instructional intervention, and a delayed post-test one month later to assess retention. Findings from this research indicate that implicit music instruction positively influences connected speech production among EFL students. Specifically, the participants' speech demonstrated enhanced fluency, stronger adherence to natural linguistic rhythm and stress patterns, and increased occurrence of reduction, linking, and coalescent assimilation processes compared to a control group undergoing traditional text-based instruction.

Key words: Connected Speech, Connected Speech Processes, Reduction, Linking, Coalescent Assimilation, Music

Introduction

English as a Foreign Language (EFL) pronunciation instruction often prioritizes the development of phonemic awareness and the systematic drilling of segmental elements. However, recent scholarly discourse underscores the limitations of this isolated approach in fostering not only communicative competence but also suprasegmental level development, which is crucial for natural speech rhythm, prosody, and overall intelligibility (Brown & Kondo-Brown, 2006; Pennington & Rogerson-Revell, 2019; Suwartono & Mayaratri, 2019). More natural, acquisition-based as opposed to learning-based approaches are being advocated, opting for different pronunciation teaching techniques, such as immersive listening practices and interactive phonetic exercises that encourage real-time feedback and adaptation.

Native English speakers tend to articulate while speaking in a most effective manner and run segments together, which is a key feature of suprasegmental aspects of speech. These suprasegmental characteristics, such as rhythm, stress, and intonation, contribute to the natural flow of spoken language, yet they often pose challenges for EFL learners in both production and comprehension. The effect of this articulation results in linguistic units flowing together in a speech continuum where words are smoothly connected without clear-cut boundaries between them, as Halliday and Matthiessen (2004) claim: “The stretch of speech is continuous; we stop and pause for breath from time to time [but] none of the units has clearly identifiable boundaries, some definite point in time where it begins and ends” (p. 5). This continuous sequence as found in everyday utterances and conversations is referred to as connected speech (Roach, 2009, p. 107). Brown and Kondo-Brown (2006) define connected speech as an “analysis of the continuous chains in normal spoken language and conversation as compared with the typical linguistic analysis of individual phonemes analyzed in isolation” (p. 284). Connected speech – or Sandhi variation as it is otherwise known – comprises a range of acoustic simplifications, context-induced phonetic modifications and fine distinctions as opposed to word pronunciation in isolation. They are commonly referred to as connected speech processes (CSPs) or phenomena and include various reductions, elision, assimilation, intrusion, juncture, linking, contraction, and other phenomena as widely reported by scholars (Barry, 1992; Hieke, 1989; Shi et al., 2005; etc.). CSPs are traditionally seen as optional and dependent on style, accent, and rate (Kohler, 1990); however, they are generally present in most languages and prevalent in everyday rapid speech as well as in colloquial speech style (Brown & Kondo-Brown, 2006). Additionally, scholars argue that CSPs are shaped by biologically general processes, i.e. they occur due to the motor economy of the speaker or coarticulation that results from physical properties: “the movements of different articulators for the production of successive segments overlap in time and interact with one another” (Farnetani & Recasens, 2010, p. 316). As a result of this gestural overlap, native speakers naturally produce CSPs effortlessly, whereas EFL learners may struggle with both recognizing and reproducing these patterns. This

difficulty stems from the need to process reduced and linked speech forms in real time, requiring additional auditory training and practice in suprasegmental features to enhance both comprehension and spoken fluency.

Against this backdrop, the present study aims to investigate and evaluate the development of English connected speech production skills among EFL learners. Through an exploration of the efficacy of musical approach, this research seeks to contribute to a deeper understanding of how best to support EFL learners in acquiring the nuanced skills necessary for effective communication in real-world contexts.

1. CSPs in EFL

The manifestation of spoken English connected speech is profoundly influenced by the stress-timed nature of English rhythm, predicated upon the premise that stressed and unstressed syllables adhere to relatively isochronous duration patterns, wherein stresses recur at regular intervals (Abercrombie, 1967; Ladefoged, 1975; Pike, 1945). This rhythmic framework necessitates speakers to manipulate syllabic duration through stretching or compressing syllables to conform to typical foot durations, thereby alternating between weak and strong syllable sequences. Consequently, this process entails various phonological phenomena, including vowel reduction, compression of unstressed syllables, and CSPs such as assimilation, elision, merge, and liaison. Despite criticism questioning the rigidity of this rhythmic typology (Dauer, 1987), certain stress-timed phonological features of English remain pivotal for EFL learners, aiding in their acquisition of natural acoustic cues for connected English speech production and comprehension in everyday contexts. Brown and Kondo-Brown (2006) delineate nine features of English connected speech that should inform contemporary EFL teaching and learning curriculum: word stress, sentence stress and timing, reduction, citations and weak forms, elision, intrusion, assimilation, transition, and contraction. Emphasizing the importance of authentic CSPs instruction, it is often advocated that this approach not only fosters natural fluency in speaking but also enhances learners' listening intelligibility and linguistic proficiency (Ahmadian, 2014; Brown & Kondo-Brown, 2006; Carreira, 2008; Ito, 2006; Joyce, 2011; Matsuzawa, 2006; Pennington & Rogerson-Revell, 2019). Therefore, integrating instruction on CSPs into EFL curricula is essential for facilitating effective communication skills among learners.

In recent years, there has been a growing convergence of interest among phoneticians and educationalists regarding the development of connected speech proficiency among both native and non-native speakers. Consequently, a variety of techniques and approaches, such as shadowing exercises, phonetic training, listening discrimination tasks, and prosodic pattern analysis, particularly within EFL teaching and learning curricula, have been implemented to enhance EFL students' natural connected speech production and perception. Despite the inherent challenges associated with instructing connected speech in EFL settings, the utilization of CSPs in conjunction with pedagogical approaches has been successfully employed,

investigated, and documented across numerous educational experiments and scientific studies (Ahmadian, 2014; Brown & Kondo-Brown, 2006; Carreira, 2008; Ito, 2006; Joyce, 2011; Matsuzawa, 2006; Pennington & Rogerson-Revell, 2019; etc.).

Ito (2006) observed that non-native speakers often perceive English connected speech differently from what they typically encounter in language classrooms. Matsuzawa (2006) conducted a study involving business professionals, noting a significant improvement in participants' ability to recognize spoken words and comprehend weak forms following instruction on CSPs. Moreover, Matsuzawa found a strong correlation between English proficiency levels and comprehension of reduced forms. Similar findings were replicated among Japanese and other Asian non-native English speakers in studies conducted by Romanko (2008) and Carreira (2008), where instruction on reduced forms led to notable enhancements in CSP performance during post-course listening dictations. Additionally, Romanko (2008) reported that participants retained acquired knowledge even two months after initial instruction.

Brown and Kondo-Brown (2006) extensively researched CSPs, devising various methods for constructing tests related to these phenomena. Joyce (2011) explored the relationship between second language (L2) listening proficiency and linguistic and psycholinguistic components, highlighting the significance of reduced forms in aural proficiency. Ahmadian (2014) conducted an experiment suggesting that explicit instruction on CSPs positively impacted EFL learners' listening comprehension skills. In these studies, learners received explicit, form-focused instruction on reduced forms or other CSPs, followed by opportunities to assess comprehension through dictation exercises. It is noteworthy that implicit instruction-based studies on CSPs are exceedingly scarce, warranting further investigation into alternative instructional methodologies.

2. The Use of Music for CSPs

The current research is based on the use of music for the implicit development of CSPs and advocates an idea that the model with music use facilitates the production of CSPs naturally without a deliberate forcing or imperative instruction. While singing successive phonetic segments overlap in time and form a continuum, i.e. singing requires careful linking of words; in consequence, natural acquisition of speech continuum takes place.

2.1. The Relationship between Language and Music

The intricate relationship between language and music transcends mere coincidence and pervades various fields, spanning evolutionary biology, neurology, cognitive sciences, and education. Brown's (2000) proposition that tonality constituted the ancestral state of language, and Mithen's (2005) assertion that musicality predated

language, underscore the intertwined evolutionary pathways of these two domains. Early communication practices utilized by pre-modern societies emphasized the emotive power of pitch, rhythm, and melody to convey intricate emotions and information, suggesting an innate connection between music and linguistic expression. Contemporary neurological investigations corroborate this interconnection, highlighting shared mechanisms within the brain where processes across hemispheres contribute to the processing and retention of information in both language and music (Patel, 2008; Toader et al., 2023).

Moreover, music emerges as a compelling mnemonic device for acquiring linguistic structures, supported by extensive research conducted by scholars such as Gfeller (1986), Wallace (1994), and Haut and Hoemberg (2014). The sensory-perceptual and cognitive features common to both language and music further reinforce their intrinsic connection, characterized by auditory signals, analogous acoustic parameters, and hierarchical structures conveyed through the auditory-vocal modality. This integration profoundly influences phonetic skill activation and formation, as evidenced by studies by Besson et al. (2007), Milovanov (2009) and Harvey (2017), signifying the transformative impact of music on language acquisition and processing. Furthermore, the analogy between language and music extends beyond the segmental level, encompassing nuanced suprasegmental elements such as stress, rhythm, intonation, and phrasing, which play pivotal roles in communication and expression. This expanded understanding illuminates the depth of the relationship between language and music, emphasizing their symbiotic nature and profound implications for human cognition and communication across diverse cultural and linguistic contexts.

2.2. Pedagogical Support

Furthermore, the concept of utilizing music for linguistic purposes finds strong support within a diverse collection of didactic trends and theoretical paradigms that underscore the importance of accommodating varied learning styles, intelligences, and aptitudes (Fleming, 2001; Gardner, 1991; Milovanov, 2009; Robinson et al., 2022). This pedagogical approach not only highlights the multifaceted advantages of music education but also emphasizes its broader impact on cognitive and psychological faculties, thereby reinforcing their stimulation and development. Gardner's (1991) seminal Theory of Multiple Intelligences advocates for an inclusive educational framework that recognizes and cultivates a broad spectrum of talents and competencies, including musical intelligence. According to Gardner (1991), individuals with musical intelligence possess a heightened auditory acuity, enabling them to perceive and manipulate musical structures while absorbing information through auditory modalities effortlessly. Furthermore, Gardner (1991) posits a structural congruence between musical and linguistic intelligences, suggesting potential synergies in learning processes that could enhance language acquisition outcomes. Fleming's (2001) taxonomy of learning styles further elucidates the significance of auditory learners,

highlighting their proclivity for auditory-based learning modalities. Milovanov's (2009) research explores the intersection of musical aptitude and second language acquisition, positing a positive correlation between musical proficiency and second language pronunciation skills. Moreover, Milovanov's (2009) findings suggest that individuals with higher musical aptitude exhibit more robust brain activation in response to musical stimuli, potentially facilitating their adaptation to the phonetic intricacies of a second language. Robinson et al. (2022) analyze the consequences of promoting all learning styles in the classroom and offers insights into future directions in research and practice. In addition, Degrove (2022) emphasizes that incorporating music in language learning can particularly benefit learners with a strong musical background, as their enhanced auditory processing abilities may facilitate the acquisition of prosodic and phonetic elements in a new language.

In addition to these theoretical underpinnings, the integration of music into language instruction resonates with Krashen's (1981) Theory of Second Language Acquisition (SLA), offering valuable insights into its pedagogical efficacy. Krashen's model, comprising five SLA hypotheses, synergizes harmoniously with the immersive qualities of music-based learning. Music, renowned for its calming and immersive attributes, can lower learners' affective filters, thereby creating an optimal environment for the absorption of new linguistic information, as postulated by Krashen (1981). Furthermore, music and songs epitomize the principles of the natural input hypothesis, providing learners with authentic and unconsciously acquired linguistic input. This alignment underscores the pedagogical potency of music as a conduit for language acquisition, offering learners a captivating and immersive avenue for linguistic development.

Beyond its theoretical foundations, the incorporation of music into language pedagogy aligns with broader educational trends emphasizing the importance of differentiated instruction and the cultivation of diverse learning modalities. By integrating music into language curricula, educators can tap into the rich potential of auditory-based learning modalities, catering to the needs and preferences of auditory learners while fostering a more inclusive and engaging learning environment. Moreover, the use of music as a mnemonic device can enhance learners' retention and recall of linguistic structures, emphasizing the intrinsic connections between auditory stimuli and memory consolidation processes. Thus, the integration of music into language instruction represents a multifaceted approach that not only enhances linguistic proficiency but also cultivates broader cognitive and affective competencies essential for successful language acquisition and communication.

3. Subjects, Method and Procedures

The current research aims to comprehensively explore the potential influence of singing on the development of connected speech skills among first-year university students studying EFL. This investigation was conducted as a seminar-based quasi-experimental study involving 48 participants from the English Philology programme at Vilnius University. The participants, all first-year undergraduate students aged between 18 and 21, were native speakers of Lithuanian with at least B2-level proficiency in English, as determined by their university entrance exam results. In addition to English and their mother tongue, some students also had knowledge of other languages, such as Russian, Polish, or German. The group consisted of 34 female and 14 male students, reflecting the common gender distribution within philology programmes.

For the purposes of the study, participants were randomly assigned to one of two groups: the control group (CG) and the test group (TG), each consisting of 24 students. The control group followed a traditional text-reading approach, whereas the test group was exposed to an innovative music-based instructional method. The target text (TT) used in the experiment was a segment from an English folk song “Daisy Bell”, carefully selected for its narrative coherence and phonetic characteristics relevant to CSPs. In order to prevent pre-existing familiarity with a melody from influencing speech rhythm and prosody, a section without a strong inherent tune was chosen. The TT consisted of 16 lines and 70 words, incorporating key CSPs such as vowel reduction, consonant-to-vowel linking, vowel-to-vowel linking, and assimilation.

The study followed a three-phase experimental design, consisting of a pre-test, a post-test, and a delayed post-test. In the pre-test phase, participants were recorded while reading the TT aloud, providing baseline data on their use of connected speech features. Following this initial assessment, the training intervention was introduced. The test group participated in a music-based instruction session in which they sang the TT twice, following a recorded musical accompaniment. The control group, on the other hand, engaged in silent reading of the same text for the same duration. The decision to use silent reading rather than aloud reading in the control group was made in order to ensure that the potential effects observed in the test group could be attributed specifically to the act of singing rather than general vocal practice.

After the training session, participants completed a post-test, in which they performed a second recorded reading of the TT to measure immediate changes in their use of CSPs. To assess the long-term retention of any improvements, a delayed post-test was conducted one month later, allowing for an evaluation of whether the effects of the intervention persisted over time.

The analysis of participants’ recorded productions was conducted auditorily by the author of this study, who possesses a background in musical education. This expertise ensured a nuanced evaluation of prosodic accuracy, fluency, and CSP integration. In addition to auditory analysis, basic acoustic measurements were also considered,

particularly in relation to the duration of linking and reduction phenomena, in order to provide further empirical support for the qualitative assessments.

The methodological framework of this study was carefully structured to ensure a comprehensive examination of the relationship between singing and the development of connected speech skills in EFL learners. By integrating music-based instruction into pronunciation training, the research aims to contribute to the ongoing exploration of innovative pedagogical approaches that leverage the intrinsic connection between language and music to enhance speech fluency and natural prosodic patterns.

4. Results and Discussion

The findings of the study encompassed an analysis of four distinct variables: vowel reduction (VR), consonant-to-vowel linking (C-V), vowel-to-vowel linking (V-V), and coalescent assimilation (CA). These CSPs are widely recognized as essential components of spoken English fluency and intelligibility (Roach, 2009; Brown & Kondo-Brown, 2006).

Vowel reduction, a phenomenon highlighted by Roach (2009), refers to the tendency of vowels to centralize, particularly in unstressed syllables or affixes. This feature is considered a key aspect of English stress-timed rhythm (Ladefoged, 2001) and plays a critical role in prosodic organization and lexical accessibility (Dauer, 1983). As previous research suggests, non-native speakers often struggle with vowel reduction due to differences in first language phonetic structures (Gimson & Cruttenden, 2014).

Meanwhile, linking, which ensures smooth phonetic transitions across word boundaries, was categorized following Dauer and Browne's (1992) classification: consonant-to-vowel (C-V), vowel-to-vowel (V-V), and consonant-to-consonant (C-C) linking. Due to the phonetic complexity of C-C linking, this study focused on C-V and V-V junctures, where transitions often involve the insertion of linking sounds such as /r/, /j/, /g/, and /w/ (Gimson & Cruttenden, 2014; Brown, 2011). Research has shown that EFL learners, particularly those from non-rhotic language backgrounds, may struggle with linking, often introducing glottal stops or omitting linking entirely (Cutler, 2015).

Finally, coalescent assimilation, described by Roach (2009) as the merging of adjacent phonemes into a qualitatively new sound, typically results from articulatory adjustments in rapid speech. This process, commonly associated with palatalization (Brown, 2011), is a well-documented phenomenon in phonetic studies. SLA studies suggest that learners may underuse or misapply this feature, affecting speech naturalness and fluency (Jenkins, 2000; Shockey, 2003).

By analyzing these four variables, the study provides insights into how connected speech features can be effectively integrated into EFL instruction to enhance pronunciation and spoken fluency.

The data analysis, as presented in Table 1 and visualized in Figure 1, indicated that participants in the test group (TG) exhibited marginally fewer occurrences of

CSPs in the target text (TT) during the pre-test phase compared to the control group (CG), although this discrepancy was not deemed significant. However, following the implementation of music-based treatment in the TG, notable changes in performance were observed, with significantly higher instances of CSP utilization evident across all four variables (totalling 1088 tokens) relative to the CG's performance (totalling 846 tokens) following traditional text-based instruction. Notably, the TG displayed pronounced proficiency in VR and C-V linking, with both post-treatment and delayed post-test assessments revealing increased CSP token counts compared to the initial TG performance. These findings underscore the efficacy of music-based instruction in facilitating the natural incorporation of CSPs within connected speech among EFL learners.

Table 1. *The results of 4 variables tested before and after treatment in CG and TG*

	Tokens of CSPs											
	Pre-test				Post-test				Delayed post-test			
Subjects	VR	C-V	V-V	CA	VR	C-V	C-V	CA	VR	C-V	C-V	CA
CG	240	168	72	84	348	286	102	110	290	241	98	90
TG	236	173	66	69	457	376	140	115	387	323	127	97
<i>TG over to CG</i>	-4	+5	-6	-15	+109	+90	+38	+5	+97	+82	+29	+7

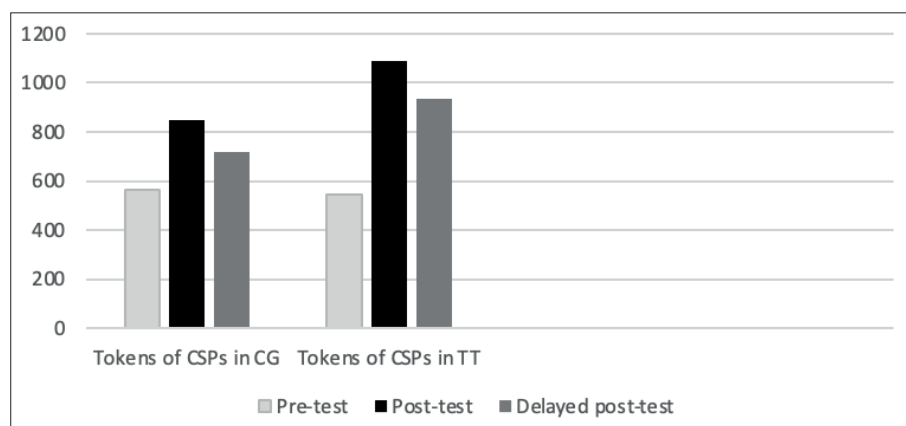


Figure 1. *The total number of tokens of CSPs employed by CG and TG*

Remarkably, upon evaluation of the delayed post-test outcomes, it was revealed that both CG and TG demonstrated sustained proficiency in connected speech

production, with CG and TG registering 719 and 934 tokens of CSPs, respectively. This observation of comparable performance levels between the two groups in the delayed post-test phase diverges from the initial hypothesis, which postulated that the music treatment group would exhibit superior outcomes owing to the mnemonic properties of music and its purported enhancement of cognitive functions through rhythmic patterns.

The analysis of delayed post-test results indicated that participants from both the control and test groups maintained relatively high levels of connected speech proficiency, with the TG exhibiting a slightly higher number of CSP tokens compared to the CG. This unexpected convergence in performance between the two groups challenges the anticipated advantages of music-infused instruction in facilitating connected speech development.

These findings underscore the importance of comprehensive assessments and longitudinal studies to better understand the lasting impacts of instructional interventions on language skill development. Moreover, they highlight the need for nuanced interpretations of research outcomes, considering factors beyond the immediate effects of instructional stimuli on skill acquisition and retention.

Conclusions

Teaching pronunciation transcends the mere identification and practice of individual phonemes or segments, encompassing a broader focus on connected speech, which involves various phonetic and motor adjustments. Unlike the careful articulation of words in isolation, connected English speech entails a range of modifications and processes. This paper provides an overview of previous research on the acquisition and recognition of CSPs and investigates the efficacy of an implicit music-based instructional model in enhancing the production of CSPs among EFL learners.

The findings suggest that the music-based instructional intervention may offer some benefits in promoting the acquisition and production of CSPs among EFL learners. However, while the TG exhibited greater proficiency in certain CSPs immediately following the treatment, the similarities in recall performance between the two groups in the delayed post-test phase raise questions about the lasting effectiveness of the music-based approach. Further research is warranted to explore the long-term impacts of such interventions and to elucidate the underlying mechanisms contributing to the observed outcomes.

Moreover, the study underscores the importance of considering the broader context of language learning and the multifaceted nature of connected speech in instructional practices. It highlights the need for educators to adopt holistic approaches that address not only segmental pronunciation but also the suprasegmental level, recognizing the intricate interplay between phonetic, motor, and cognitive processes involved in fluent speech production. Suprasegmental features, such as rhythm, intonation, and stress patterns, are crucial for natural speech flow and intelligibility, making their inclusion

in pronunciation training essential. As such, future pedagogical interventions should strive to integrate diverse instructional techniques, including implicit music-based methods, to optimize language learning outcomes and foster greater proficiency in connected speech among EFL learners.

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