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RHYTHM AS A MEDIATING FACTOR IN EARLY LANGUAGE DEVELOPMENT: AN ACTION RESEARCH STUDY IN GREEK PRESCHOOL EDUCATION

Paraskevi Bika[1],
Maria Argyriou[2i]
[1]Department of Pre-School Education & Educational Design School of Humanities, University of The Aegean, Greece
[2]Department of Pre-School Education & Educational Design School of Humanities, University of The Aegean, Greece

Abstract:
The research focuses on rhythm as a mediating factor in early language development within preschool education, with particular emphasis on rhythm-centred musical activities embedded in everyday classroom practice. Grounded in contemporary research on music cognition, rhythmic perception, and early language acquisition, the study explores how structured yet playful rhythmic engagement may support language-related behaviours, including speech rhythm, auditory responsiveness, sustained attention, and expressive participation in young children. Adopting an action research design, the study draws on data collected from preschool teachers and student teachers who implemented rhythm-based musical activities in public and private kindergarten settings in Greece. The research was carried out over a clearly defined period, with data collection taking place between 23 November and 13 January 2025. This timeframe allowed for the systematic implementation of rhythm-based activities and the documentation of educators' observations within authentic preschool settings. Data sources included educators' observational records, pedagogical documentation, and reflective accounts concerning the integration of rhythmic musical practices into daily classroom routines. The analysis foregrounds educators' perspectives on children's engagement and communicative behaviours, rather than aiming to establish causal effects. The findings suggest that repeated engagement with rhythm-focused musical activities is perceived to support key aspects of early language development, particularly sensitivity to speech rhythm, auditory discrimination, verbal expression, and attentional regulation. Rhythm emerges as a shared temporal and communicative framework linking musical and linguistic experience through embodied and socially interactive learning processes. By situating rhythm-centred musical practice within

[i] Correspondence: email maria.argiriou@gmail.com, m.argyriou@aegean.gr

authentic preschool contexts, the study contributes to interdisciplinary discussions on music–language relationships and embodied, multimodal approaches to early learning, while offering practice-oriented insights for early childhood educators seeking inclusive and accessible pedagogical strategies for language-rich learning environments.

Keywords: rhythm; early language development; preschool education; music and language; action research

1. Introduction

Music and language constitute two fundamental dimensions of human communication and cognitive development, deeply intertwined from the earliest stages of life. Contemporary research across developmental psychology, neuroscience, and music education increasingly acknowledges that musical engagement—particularly during early childhood—supports a wide range of linguistic, cognitive, and socio-emotional processes (Patel, 2021; Goswami, 2020; Ilari *et al.*, 2021· Argyriou, 2025). Within this interdisciplinary landscape, rhythm has emerged as a central organising mechanism that bridges auditory perception, motor coordination, and communicative interaction.

From infancy, rhythmic regularities embedded in caregiver–child interactions, such as infant-directed speech, lullabies, and rhythmic play, provide children with temporal structures that support speech segmentation, phonological awareness, and expressive communication (Cirelli & Trehub, 2022; Mehr *et al.*, 2021). Neural entrainment research further demonstrates that rhythmic input aligns oscillatory brain activity with temporal patterns in both speech and music, facilitating predictive processing and enhancing linguistic comprehension (Peelle & Davis, 2021; Tierney & Kraus, 2022). These findings suggest that rhythm operates not merely as a musical feature, but as a mediating factor in early language development.

Despite growing evidence linking musical rhythm and language-related outcomes, much of the existing literature has focused on formal music training or experimental interventions, often detached from everyday educational practice (Habibi *et al.*, 2018; Politimou *et al.*, 2022). Less attention has been given to rhythm-centred musical activities as they naturally occur in preschool classrooms, particularly through play-based, embodied, and socially interactive practices. Moreover, while quantitative studies have demonstrated associations between rhythmic skills and linguistic abilities, there remains a relative lack of qualitative, practice-oriented research that foregrounds educators' perspectives and reflective experiences.

This gap is particularly salient in early childhood education contexts, where learning is predominantly mediated through play, movement, and social interaction. Rhythm-based musical activities—such as action songs, clapping games, rhythmic chanting, and movement improvisation—are widely used by preschool educators, yet their pedagogical value for supporting early language development is often under-theorised and insufficiently documented in empirical research (Barrett & Welch, 2022; Marsh, 2022). At the same time, children's exposure to musical experiences varies significantly depending on familial, socio-cultural, and

institutional factors, raising important questions about inclusivity and access to rhythm-rich learning environments (McPherson *et al.*, 2020; Williams *et al.*, 2021).

Recent scholarship advocates for viewing rhythm not as an innate ability possessed by some children and lacking in others, but as a malleable, experience-dependent capacity that can be nurtured through pedagogical practice (Welch *et al.*, 2020; Bhide *et al.*, 2021). Within this perspective, rhythm-centred musical engagement becomes a powerful educational resource, capable of supporting linguistic participation, expressive confidence, and communicative responsiveness in diverse preschool populations. In response to these considerations, the present study adopts an action research approach to investigate the role of rhythm-centred musical activities in preschool education, with particular emphasis on their relationship to early language development. Action research is especially well-suited to this inquiry, as it foregrounds educators' reflective practice, values context-specific knowledge, and seeks to generate pedagogically meaningful insights grounded in everyday classroom realities (Kemmis *et al.*, 2014; Reason & Bradbury, 2019).

The study explores how rhythm-based musical practices are perceived, implemented, and evaluated by preschool educators and student teachers, focusing on observable indicators of musical engagement and language-related behaviours. Rather than aiming to establish causal relationships, the research seeks to illuminate how rhythm functions as a mediating factor within complex educational environments, shaping children's participation, interaction, and communicative expression.

Guided by the above theoretical and pedagogical considerations, the study addresses the following research questions:

- **RQ1**: How does systematic engagement with rhythm-centred musical activities influence the development of musical skills in preschool children, as perceived by early childhood educators?
- **RQ2**: What differences do educators report between children who are systematically exposed to rhythm-based musical practices and those with limited rhythmic musical exposure, in terms of musical engagement and responsiveness?
- **RQ3**: In what ways does repeated exposure to rhythm-based musical activities mediate aspects of early language development, particularly speech rhythm, expressive participation, and auditory responsiveness, in preschool settings?
- **RQ4**: How do preschool educators and student teachers reflect on the pedagogical value of rhythm-focused musical activities for supporting early language development within everyday classroom practice?

By addressing these research questions, the study aims to contribute to contemporary discussions on music–language relationships, early childhood pedagogy, and reflective educational practice. Specifically, it seeks to enrich the literature with empirically grounded insights into how rhythm-centred musical engagement can support early language development in inclusive, play-based preschool environments, while simultaneously empowering educators as reflective practitioners and co-constructors of pedagogical knowledge.

2. Literature Review

Rhythm constitutes a fundamental organising principle in both music and language, operating as a temporal framework through which auditory information is structured, anticipated, and meaningfully processed. Contemporary research in developmental neuroscience and music cognition consistently highlights rhythm as a core mechanism underpinning early auditory perception, motor coordination, and communicative interaction (Ladinig & Honing, 2020; Patel, 2021; Tierney & Kraus, 2022). From infancy, rhythmic regularities embedded in caregiver–infant interactions—such as infant-directed speech, lullabies, and nursery rhymes—support the segmentation of auditory streams and facilitate early language acquisition (Mehr *et al.*, 2021; Cirelli & Trehub, 2022). Neural entrainment studies demonstrate that rhythmic input aligns oscillatory brain activity with temporal patterns in speech and music, enhancing perceptual sensitivity and predictive processing (Giraud & Arnal, 2018; Goswami, 2020; Peelle & Davis, 2021).

Recent evidence suggests that rhythm functions not merely as an aesthetic component of musical experience but as a mediating factor that bridges auditory perception, motor synchronisation, and linguistic processing (Ravignani *et al.*, 2019; Gordon *et al.*, 2021). In preschool-aged children, rhythmic engagement has been associated with improvements in speech rhythm perception, phonological awareness, and expressive language participation (Bhide *et al.*, 2021; Politimou *et al.*, 2022). These findings provide a strong theoretical foundation for RQ1 and RQ3, positioning rhythm-centred musical activities as pedagogically meaningful practices that support both musical skill development and early language-related behaviours in preschool contexts.

Rhythmic abilities emerge early in human development and are expressed initially through spontaneous bodily responses to sound, including rocking, swaying, and rhythmic vocalisations (Phillips-Silver & Trainor, 2007; Zentner & Eerola, 2019). Longitudinal research indicates that rhythmic synchronisation skills develop progressively throughout the preschool years, influenced by both biological maturation and environmental exposure (Provasi *et al.*, 2014; Nave-Blodgett *et al.*, 2021). Recent studies emphasise that rhythmic imitation typically precedes accurate pitch reproduction, suggesting that rhythm may constitute a more accessible entry point into musical engagement for young children (Gordon *et al.*, 2015; Flaugnacco *et al.*, 2018; Habibi *et al.*, 2022· Argyriou, 2025b). Moreover, rhythmic competence has been linked to executive functions such as attention regulation, working memory, and cognitive flexibility—skills that are closely related to language development (Tierney & Kraus, 2022; Williams *et al.*, 2023).

Importantly, rhythm-based activities that integrate movement and speech—such as clapping games, action songs, and rhythmic chanting—appear particularly effective in supporting sustained engagement and participation among preschool children (Barrett *et al.*, 2021; Barrett & Welch, 2022). These findings align with the principles of embodied cognition, which posit that learning emerges through sensorimotor interaction with the environment (Varela *et al.*, 2017; Glenberg, 2020). This body of literature directly informs RQ1, supporting the

examination of educators' perceptions of rhythmic musical activities as catalysts for musical skill development within everyday classroom practice.

Play constitutes the primary mode of learning in early childhood, providing a natural context for experimentation, social interaction, and meaning-making (Whitebread *et al.*, 2017; Hirsh-Pasek *et al.*, 2020). Within preschool education, musical play—particularly rhythm-based group activities—serves as a powerful pedagogical medium through which children explore sound, movement, and language simultaneously. Contemporary music education research underscores the value of rhythmic games in fostering cooperative behaviour, turn-taking, and shared attention, all of which are foundational to communicative competence (Kirschner & Tomasello, 2010; Rabinowitch & Meltzoff, 2017; Ilari *et al.*, 2021). Rhythm-centred musical play supports collective timing and synchronisation, promoting social bonding and emotional regulation (Cirelli *et al.*, 2020; Savage *et al.*, 2021). In culturally responsive pedagogies, traditional rhymes, folk songs, and movement games have been shown to enhance linguistic richness while strengthening children's sense of belonging and cultural identity (Barrett *et al.*, 2021; Marsh, 2022). Such practices align with contemporary early childhood curricula that emphasise multimodal, experiential learning environments. The pedagogical relevance of rhythmic musical play is particularly salient for RQ2 and RQ4, as it enables educators to observe differences in engagement and responsiveness among children with varying levels of musical exposure and to reflect critically on the role of rhythm-focused practices in inclusive classroom settings.

Despite the recognised benefits of early musical engagement, children's exposure to music varies considerably depending on familial, socio-cultural, and educational contexts (McPherson *et al.*, 2020; Williams *et al.*, 2021). Research indicates that limited access to rhythmic musical experiences may be associated with reduced auditory discrimination skills, lower expressive participation, and diminished confidence in group activities (Habibi *et al.*, 2018; Politimou *et al.*, 2022). Importantly, contemporary scholarship cautions against deficit-oriented interpretations of limited musical exposure, advocating instead for pedagogical approaches that view rhythmic engagement as a modifiable environmental factor rather than an innate ability (Welch *et al.*, 2020; Barrett & Welch, 2022). Rhythm-based classroom interventions have demonstrated potential in mitigating disparities by providing structured yet playful opportunities for participation and expression (Bhide *et al.*, 2021; Williams *et al.*, 2023). This perspective directly supports RQ2, which explores educators' observations of differences between children with varying degrees of rhythmic musical exposure, while maintaining an inclusive, strengths-based analytical framework consistent with qualitative action research methodology.

A growing body of interdisciplinary research highlights the close relationship between rhythm perception and language processing, particularly in early childhood (Patel, 2021; Goswami, 2020). Rhythmic regularities in speech—such as stress patterns, syllabic timing, and prosody—play a crucial role in word segmentation and grammatical development (Leong & Goswami, 2015; Ladinig & Honing, 2020).

Recent studies demonstrate that rhythm-based musical activities enhance phonological awareness, speech rhythm sensitivity, and expressive language behaviours in preschool

children (Bhide *et al.*, 2021; Politimou *et al.*, 2022; Williams *et al.*, 2023). These effects are often mediated through embodied participation, where movement synchronised with sound reinforces temporal prediction and attentional alignment (Phillips-Silver *et al.*, 2018; Tierney & Kraus, 2022). From a socio-interactional perspective, theories of communicative musicality emphasise rhythm as a shared temporal structure that supports early dialogic exchanges between caregivers and children (Malloch & Trevarthen, 2009; Trevarthen, 2019). Such rhythmic coordination fosters emotional attunement and communicative intent, laying the groundwork for language development. These findings provide robust theoretical grounding for RQ3, framing rhythm as a mediating factor that links musical engagement with observable indicators of early language development in preschool settings.

Action research frameworks foreground educators' reflective engagement with their own pedagogical practices, recognising teachers as co-constructors of knowledge (Kemmis *et al.*, 2014; Reason & Bradbury, 2019). In early childhood music education, reflective inquiry enables practitioners to critically examine how rhythm-focused activities shape children's engagement, communication, and learning trajectories (Burnard & Dragovic, 2015; Barrett & Welch, 2022). Recent studies highlight that educators perceive rhythm-based musical practices as accessible, adaptable, and highly responsive to children's needs, particularly in linguistically diverse classrooms (Ilari *et al.*, 2021; Marsh, 2022). Reflection through journals, observations, and collaborative discussion allows teachers to identify both challenges and affordances in implementing such practices within everyday routines. The presented literature directly informs RQ4, situating educators' reflections as essential data sources for understanding the pedagogical value of rhythm-centred musical activities in supporting early language development.

Table 1 provides a conceptual overview of the main thematic areas that structure the Literature Review and illustrates their systematic alignment with the research questions guiding the present study. The table functions as a coherence map, demonstrating how the theoretical discussion is purposefully organised to support the analytical focus of the research and to justify the selected methodological approach. Specifically, the thematic areas related to rhythm and auditory processing, as well as rhythmic skill development in early childhood, establish the theoretical foundation for RQ1, which examines educators' perceptions of children's musical skill development through rhythm-centred activities. These sections draw on research in music cognition and developmental psychology to conceptualise rhythm as a core temporal mechanism underlying musical engagement.

Table 1: Key Thematic Areas of the Literature Review and Alignment with Research Questions

Thematic Area	Core Focus	Related Research Questions
Rhythm and auditory processing	Temporal organisation, neural entrainment	RQ1, RQ3
Rhythmic skill development	Movement, synchronisation, musical engagement	RQ1
Musical play and pedagogy	Group rhythm games, embodied learning	RQ2, RQ4
Variability in musical exposure	Environmental differences, inclusion	RQ2
Rhythm and language development	Speech rhythm, expressive participation	RQ3
Educator reflection	Action research, pedagogical meaning	RQ4

The themes addressing musical play, rhythm-centred pedagogy, and variability in musical exposure are directly linked to RQ2 and RQ4, as they foreground pedagogical practice, classroom interaction, and educators' reflective perspectives. This alignment highlights the relevance of rhythm-based musical activities within inclusive, play-based preschool environments and supports the use of qualitative, practice-oriented inquiry. Furthermore, the thematic focus on rhythm and early language development corresponds explicitly to RQ3, framing rhythm as a mediating factor that connects musical experience with observable language-related behaviours, such as speech rhythm, expressive participation, and auditory responsiveness. Overall, Table 1 demonstrates that the Literature Review is not presented as a descriptive background, but as a theoretically driven framework that directly informs the formulation of the research questions and the design of the action research study.

Table 2 outlines the main categories of rhythm-based musical activities implemented in the preschool settings and illustrates how each activity type is associated with specific musical foci and language-related indicators. The table serves to operationalise the concept of rhythm as a mediating factor by linking concrete pedagogical practices with observable aspects of children's engagement and communicative behaviour.

The activities presented—such as action songs, rhythmic chanting, clapping games, and movement-based improvisation—represent forms of embodied, socially interactive musical engagement that are commonly embedded in everyday preschool routines. Each activity type foregrounds particular rhythmic elements, including pulse, tempo, synchronisation, and stress patterns, which are theoretically associated with temporal prediction, attentional alignment, and prosodic sensitivity. The language-related indicators listed in the table do not function as standardised measures, but as qualitative observation points consistent with the action research methodology adopted in this study. Indicators such as expressive participation, speech rhythm sensitivity, auditory responsiveness, and interactional engagement reflect aspects of early language development that can be meaningfully observed and interpreted by educators within naturalistic classroom contexts.

Table 2: Rhythm-Based Musical Activities as Mediating Practices

Activity Type	Musical Focus	Language-Related Indicators Observed
Action songs	Pulse, tempo, coordination	Expressive participation, speech rhythm
Rhythmic chanting	Stress patterns, timing	Phonological awareness, articulation
Clapping games	Synchronisation, turn-taking	Attention, interactional responsiveness
Movement improvisation	Embodied rhythm	Emotional expression, communicative intent

By presenting rhythm-based musical activities alongside their associated musical and language-related dimensions, Table 2 clarifies how pedagogical practice is analytically connected to the study's focus on early language development. It also reinforces the practice-oriented and inclusive orientation of the research, highlighting rhythm-centred musical activities as accessible pedagogical resources that support language-rich learning environments without relying on formal testing procedures.

Contemporary research positions rhythm as a central mediating mechanism linking musical engagement with early language development. Rhythm-centred musical activities support auditory processing, embodied participation, and social interaction, providing fertile ground for the development of expressive and communicative skills in preschool children. Variability in musical exposure underscores the importance of inclusive, practice-based interventions that foreground rhythm as an accessible and modifiable pedagogical resource. By integrating insights from music cognition, developmental psychology, and early childhood pedagogy, the present study addresses RQ1–RQ4 through an action research framework that foregrounds educators' reflective perspectives and classroom-based practices. On the basis of this theoretical framework, the following section outlines the methodological design of the action research study, detailing the participants, data collection procedures, and analytical approach employed.

3. Materials and Methods

3.1 Research Design and Methodological Rationale

The research adopts a qualitative participatory action research design, which is particularly suited to investigating pedagogical practices within authentic educational settings. Research methodology is understood not merely as a set of technical procedures, but as a systematic framework that explicates both the research process and the logic through which findings are generated (Cohen, Manion, & Morrison, 2007). In this sense, methodology addresses not only what is studied, but how and why specific methods are employed. Action research was selected due to its emphasis on practitioner involvement, reflective inquiry, and the close connection between theory and educational practice. Originating in the work of Kurt Lewin, action research has been widely applied in educational contexts as a means of understanding and improving teaching and learning processes through cyclical stages of planning, action, observation, and

reflection (Elliott, 1991; Kemmis & McTaggart, 2005). This approach allows educators to function simultaneously as practitioners and co-researchers, contributing experiential knowledge that would be difficult to capture through experimental or purely quantitative designs. Given the study's focus on rhythm-based musical activities as embedded classroom practices, a participatory action research framework provides an appropriate epistemological and methodological foundation. It enables the exploration of educators' perceptions, pedagogical decisions, and reflective insights regarding children's musical and language-related engagement, rather than seeking to establish causal relationships.

3.2 Research Questions

The research questions were formulated to align with the qualitative and practice-oriented nature of the study and to reflect the theoretical framework developed in the Literature Review. Following Newby (2019), the formulation of research questions is considered a critical stage in research design, as it directly informs data collection and analytical procedures. The study was guided by the following research questions:

- How do educators perceive the contribution of rhythmic musical experiences to the development of musical skills in preschool children?
- What differences do educators observe between children who are systematically exposed to rhythm-based musical activities and those with limited or no such exposure?
- How do educators interpret the role of repeated rhythmic musical engagement in supporting aspects of early language development, particularly speech rhythm and expressive participation?
- How do rhythm-centred musical practices function within everyday preschool routines as inclusive pedagogical tools?

Questions foreground educators' perspectives and observations and are consistent with the exploratory aims of participatory action research.

3.3 Purpose of the Study

The research was carried out over a clearly defined period, with data collection taking place between 23 November and 13 January 2025. This timeframe allowed for the systematic implementation of rhythm-based activities and the documentation of educators' observations within authentic preschool settings. The purpose of the research was to examine the relationship between rhythm-centred musical experiences and the development of musical and language-related skills in children aged 4–6 years within preschool education. More specifically, the study seeks to explore how repeated engagement with rhythmic musical activities may support musical skill development and contribute to early language-related behaviours, such as sensitivity to speech rhythm, phonological awareness, and verbal expression. The research further aims to illuminate the mechanisms through which rhythmic musical engagement may mediate the relationship between music and language, focusing on educators' interpretations of children's responses to rhythm-based activities. Rather than measuring outcomes through standardised assessments, the research emphasises qualitative indicators observable within naturalistic classroom contexts. In addition, the researchers examine perceived differences in

musical and language-related engagement between children who experience systematic rhythmic exposure and those who do not, thereby contributing practice-based insights relevant to the design of inclusive early childhood music and language curricula.

3.4 Participants and Research Context

The research involved preschool teachers and student teachers working in both public and private kindergarten settings across Greece. Student teachers had completed teaching placements or practicum experiences in preschool classrooms as part of their university studies. The selection of participants aimed to capture a range of pedagogical contexts and professional perspectives, reflecting the diverse conditions under which rhythm-based musical activities are implemented in Greek preschool education. Participants were invited to contribute observations, reflections, and pedagogical documentation related to the use of rhythmic musical activities within their classrooms. Children did not participate directly as research subjects; instead, data were generated through educators' reflective engagement with their own teaching practice. This approach aligns with ethical considerations in early childhood research and is consistent with the principles of participatory action research.

3.5 Research Procedure

The research followed the cyclical structure characteristic of participatory action research. Participants engaged in the planning and implementation of rhythm-based musical activities, including action songs, rhythmic chanting, clapping games, and movement-based musical play, which were integrated into everyday classroom routines. During the action phase, educators observed children's engagement, musical participation, and language-related behaviours, paying particular attention to rhythm, synchronisation, expressive involvement, and communicative interaction. These observations informed reflective cycles in which participants documented their experiences and evaluated the pedagogical impact of the activities. The collaborative and reflective nature of the research process fostered a learning community in which educators shared insights, questioned assumptions, and refined their pedagogical practices. This participatory dimension supports the broader aims of action research as an approach that promotes professional development, democratic knowledge production, and the meaningful integration of theory and practice (Kemmis & McTaggart, 2005).

The choice of participatory action research reflects the study's commitment to contextualised, practice-based inquiry. By prioritising educators' voices and reflective engagement, the methodology acknowledges the complexity of early childhood learning environments and avoids reductionist interpretations of musical and language development. The flexible, iterative structure of action research allows for responsiveness to classroom realities and supports the ecological validity of the findings. Moreover, the focus on qualitative observation and reflection aligns with the study's conceptualisation of rhythm as a mediating, embodied, and socially situated phenomenon within early learning contexts.

Table 3 serves to visually synthesise the stages of the participatory action research process adopted in the present study. Given the cyclical and reflective nature of action research, the table provides a structured overview of the methodological progression from planning to action,

observation, reflection, and re-planning. Such visual representations are widely recommended in qualitative and practice-based research, as they enhance methodological transparency and support readers' understanding of the research logic (Cohen *et al.*, 2007; Kemmis & McTaggart, 2005). Furthermore, the table clarifies how rhythm-based musical activities were systematically embedded within everyday preschool practice, aligning methodological procedures with the study's research questions. By explicitly outlining the iterative nature of the research process, the table reinforces the epistemological coherence of participatory action research, in which knowledge production emerges through educators' reflective engagement with practice rather than through linear experimental design.

Table 3: Stages of the Action Research Process

Stage	Description of the Research Process
Identification of the problem	Identification of pedagogical needs and challenges related to rhythm-based musical practices and their role in supporting musical and language-related development in preschool children.
Planning	Design of rhythm-centred musical activities integrated into everyday preschool routines, taking into account the classroom context and children's developmental characteristics.
Action / Implementation	Implementation of rhythmic musical activities (e.g., action songs, rhythmic movement, clapping games) within authentic teaching contexts.
Observation	Systematic observation of children's engagement, musical responses, communicative behaviours, and interaction patterns during rhythm-based activities.
Reflection	Educators' reflective evaluation of the implemented practices, focusing on perceived changes in children's musical participation and language-related behaviours.
Feedback and re-planning	Collective discussion, feedback, and re-design of activities based on observations and reflections, leading to subsequent cycles of action research.

Note: The table illustrates the cyclical and reflective structure of participatory action research applied in the present study.

3.4 Data Collection Instrument

Data were collected through a purpose-designed questionnaire developed for the needs of the present study and administered online via Google Forms. The questionnaire was designed to support the participatory action research framework by capturing both structured information and reflective insights from preschool teachers and student teachers involved in rhythm-based musical practices. The instrument combined closed-ended items, aiming to collect quantitative data on the frequency, typology, and contextual integration of musical and rhythmic activities, with open-ended questions, allowing participants to articulate their personal experiences, observations, and pedagogical reflections. This mixed-format structure enabled a more comprehensive understanding of educators' practices and perceptions, in line with recommendations for qualitative-dominant educational research (Cohen *et al.*, 2007; Newby, 2019). The questionnaire was organised into five thematic sections: (a) demographic and professional characteristics of participants; (b) perceptions of musical experience and musical

skill development; (c) parameters of children's exposure to rhythmic activities; (d) perceived benefits of combined rhythm–language activities; and (e) contextual characteristics of the educational setting. This thematic organisation ensured direct alignment between the data collection instrument and the research questions, allowing for systematic exploration of the role of rhythm in supporting musical and language-related development in early childhood education.

6. Findings and Data Analysis

This section presents and analyses the data derived from the questionnaire administered to preschool teachers and student teachers. The analysis follows a descriptive and interpretive approach, in line with the action research framework, foregrounding participants' perceptions and pedagogical reflections rather than causal claims.

6.1 Participant Profile

The study involved a purposive sample of seven participants (n = 7), comprising in-service preschool teachers employed in public and private kindergarten settings, as well as student teachers who had completed supervised teaching practice placements in early childhood education contexts. All participants were actively engaged in classroom-based pedagogical work, ensuring that their contributions were grounded in first-hand professional experience. The participants represented a range of ages and levels of professional experience, including both early-career educators and more experienced practitioners. This diversity enabled the inclusion of multiple pedagogical perspectives regarding the integration of music and rhythm into preschool practice and supported the exploration of rhythm-based activities across different stages of professional development. All participants held, or were in the process of completing, formal qualifications in early childhood education, providing a shared foundational understanding of preschool pedagogy. In addition, several participants reported engagement in professional development or in-service training programmes, either during their initial studies or through continuing professional learning. Such educational and training backgrounds are particularly relevant, as they may influence educators' confidence, pedagogical choices, and readiness to implement rhythm-centred musical activities within the classroom.

In terms of gender distribution, all participants identified as female, reflecting the gendered composition of the early childhood education workforce in Greece and internationally. Although gender was not treated as an analytical variable, its uniformity contributes to a transparent contextualisation of the sample.

Participants were drawn from different institutional contexts, including both public and private kindergartens, with variations in organisational structures and numbers of teaching staff. These contextual factors are acknowledged as potentially shaping the frequency, feasibility, and forms of rhythm-based musical activities implemented in everyday practice.

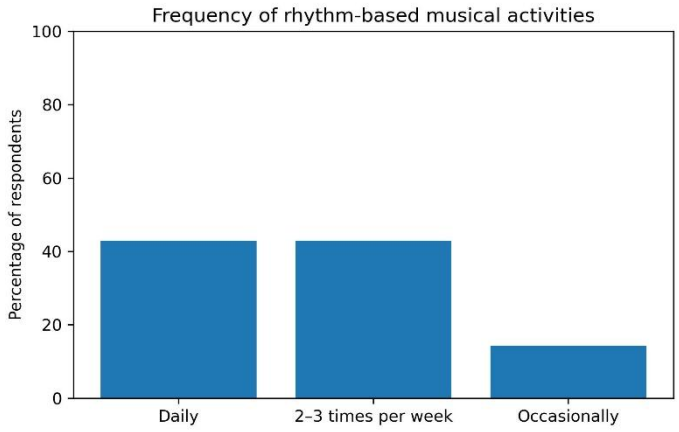
Within the framework of action research, the demographic and professional characteristics of the participants are not intended to support statistical generalisation. Instead, they function as a contextual and interpretive lens, situating educators' reflections and reported

practices within authentic preschool environments. Collectively, the participant profile confirms that the sample is pedagogically relevant, professionally situated, and well aligned with the study's aim of examining how rhythm-based musical activities are perceived, implemented, and reflected upon by practitioners in early childhood education.

6.2 Frequency and Types of Rhythm-based Activities

Analysis of participants' responses indicated that rhythm-based musical activities were integrated into preschool routines with varying, but generally high, frequency. As illustrated in Figure 1, an equal proportion of participants (42.9%) reported implementing rhythm-based activities either on a daily basis or two to three times per week, while a smaller proportion (14.3%) indicated more sporadic use. Participants reported that rhythmic activities were most commonly incorporated during the morning zone, transition periods, and circle-time activities. Frequently mentioned practices included body percussion, clapping games, rhythmic chanting, movement-based music games, and the use of simple percussion instruments. According to educators' accounts, these activities formed part of regular classroom routines rather than isolated or occasional events. The distribution presented in Figure 1 directly addresses Research Question 1, which examines whether musical experience supports the development of musical skills. The reported frequency of rhythmic engagement indicates that rhythm-centred musical practices constitute a recurring element of everyday preschool pedagogy within the participating educational contexts. These findings provide a contextual basis for the interpretation of subsequent results related to musical and language-related outcomes.

Figure 1: Frequency of rhythm-based musical activities

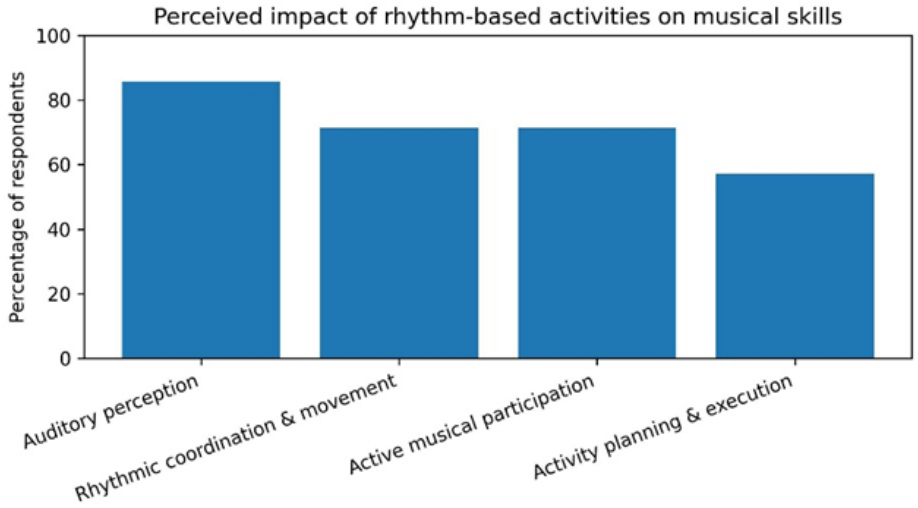


6.3 Perceived Musical Skill Development

Participants consistently associated systematic engagement in rhythm-based musical activities with the development of basic musical skills in preschool children. Educators reported observable improvements in children's sense of pulse, rhythmic coordination, listening skills, and responsiveness to musical cues. According to participants' accounts, children who were regularly exposed to rhythmic activities appeared more confident in reproducing rhythmic patterns and more willing to participate in group-based musical interactions.

As presented in Figure 2, auditory perception was identified as the most frequently supported skill (85.7%), followed by rhythmic coordination and movement (71.4%) and active musical participation (71.4%). A smaller, though still notable, proportion of participants (57.1%) reported improvements in children's ability to plan and execute musical activities. These findings directly address Research Question 1, concerning the cultivation of musical skills, and Research Question 2, which explores differences associated with systematic rhythmic exposure. Participants further indicated that repeated rhythmic engagement supported children's ability to maintain a steady pulse, synchronise movement with sound, and respond more accurately to rhythmic cues during musical activities. Importantly, educators noted that these musical improvements were more evident among children who were exposed to rhythmic activities on a regular basis, compared to those whose musical engagement was described as sporadic or limited. These observations were grounded in participants' day-to-day teaching experiences across different preschool contexts.

Figure 2: Perceived impact of rhythm-based activities on musical skills

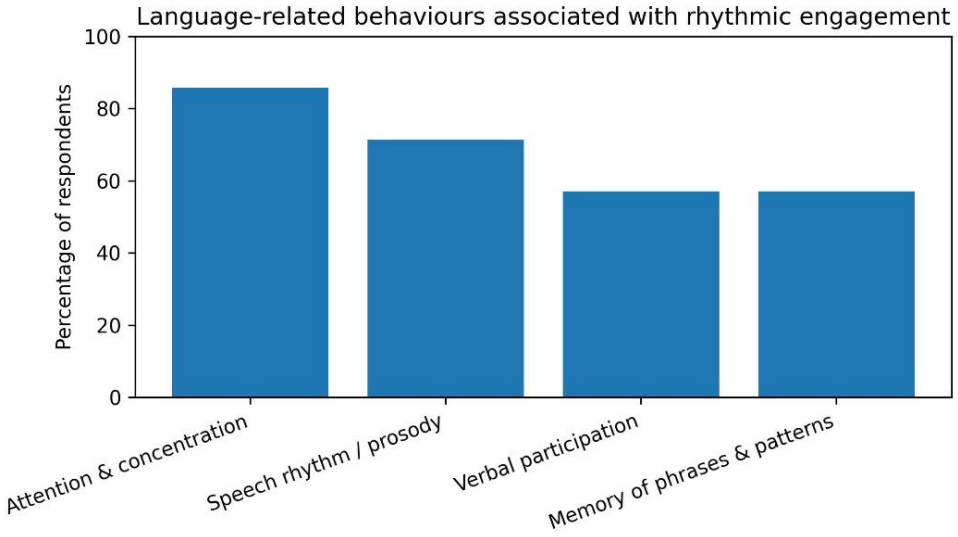


6.4 Rhythm and Language-Related Behaviours

In addition to musical outcomes, participants reported a range of language-related behaviours associated with children's engagement in rhythm-based musical activities. Educators observed increased verbal participation, enhanced speech rhythm, improved attention to linguistic patterns, and greater ease in memorising phrases, rhymes, and short verbal sequences. These observations were particularly evident in activities that combined rhythmic structure with spoken language, such as chanting, rhythmic storytelling, and action songs. As illustrated in Figure 3, the most frequently reported outcomes related to attention and concentration (85.7%), followed by improvements in speech rhythm and prosody (71.4%). More than half of the participants also reported enhancements in verbal participation (57.1%) and in children's ability to remember phrases and rhythmic patterns (57.1%). These findings directly address Research Question 3, which explores the potential benefits of repeated rhythmic exposure for the development of speech rhythm and language-related skills. Participants further noted that rhythm-based activities supported children's engagement with spoken language by

encouraging rhythmic repetition, coordinated movement–speech tasks, and structured verbal interaction. According to educators' reports, children demonstrated greater ease in producing rhythmically organised speech forms, such as chants and rhymes, and showed increased attentiveness to the prosodic features of spoken language during classroom activities. These observations were grounded in educators' day-to-day teaching experiences and were consistently reported across different educational contexts.

Figure 3: Language-related behaviours associated with rhythmic engagement



6.5 Behavioural and attentional observations

In addition to musical and language-related outcomes, participants reported observable changes in children's behaviour during and following rhythm-based activities. Educators noted increased levels of attention, sustained participation, and more regulated emotional responses when rhythmic elements were incorporated into classroom routines. Children were frequently described as more focused, cooperative, and responsive during activities involving rhythm and movement. Several participants also highlighted that rhythm-based activities appeared to support smoother transitions between classroom tasks. According to educators' reports, rhythmic patterns and structured movement helped children anticipate changes in activities, contributing to a calmer classroom atmosphere and more organised group behaviour. These observations were consistently reported across different educational settings and were grounded in educators' day-to-day pedagogical experiences.

7. Discussion

7.1 The Present Study Examined the Pedagogical Role of Rhythm as a Mediating Element between musical experience and language-related development in early childhood education, drawing on an action research design and educators' reflective accounts. By situating the findings within contemporary theoretical frameworks from music cognition, language development, and early childhood pedagogy, this discussion demonstrates how the results both

corroborate and extend existing research, while foregrounding the significance of rhythm as a pedagogically embedded, embodied, and relational phenomenon.

A central contribution of the study concerns educators' consistent perceptions that systematic engagement with rhythm-based musical activities supports foundational musical skills as well as language-related behaviours in preschool children. These observations speak directly to Research Questions 1 and 2, which explored whether musical experience supports musical skill development and whether differences are perceived in relation to the frequency and consistency of rhythmic exposure. Educators associated regular rhythmic engagement with improvements in pulse stability, rhythmic coordination, listening skills, and active musical participation. Such findings resonate with developmental models of early musical learning that emphasise temporal organisation and auditory sensitivity as core components of musical competence (Hargreaves & Lamont, 2017; Gordon *et al.*, 2015).

From a theoretical perspective, these outcomes align with accounts that position rhythm as a primary organising dimension of musical experience. Rhythm structures perception, anticipation, and coordinated action, enabling children to engage meaningfully with sound over time. Importantly, the present study suggests that such competencies can be fostered through rhythm-centred, embodied, and vocal activities that are developmentally appropriate for preschool contexts, rather than through formal instrumental instruction. This finding extends existing research by highlighting rhythm as an accessible entry point to musical learning within everyday classroom routines, reinforcing its pedagogical relevance in early childhood education. The findings further align with Aniruddh Patel's theoretical account of shared processing resources between music and language (Patel, 2008; 2014). According to Patel, both domains rely on temporal sequencing, predictive processing, and hierarchical structuring. Educators' observations that rhythmic engagement supported not only musical coordination but also verbal fluency and articulation suggest that rhythm may function as a cross-domain organiser, facilitating the coordination of perceptual, motor, and cognitive processes across music and language. Notably, the study indicates that such cross-domain benefits emerge within playful, movement-based, and vocal musical practices, underscoring the relevance of integrated pedagogical approaches in early childhood settings.

The relationship between rhythm and language-related behaviours, addressed explicitly in Research Question 3, constitutes another key dimension of the study's contribution. Educators consistently reported improvements in children's speech rhythm, prosody, verbal participation, and attentional engagement following sustained exposure to rhythm-based activities. These observations align closely with Usha Goswami's temporal sampling framework, which posits that sensitivity to rhythmic and amplitude modulations in auditory input underpins phonological awareness and speech processing (Goswami, 2011; 2019). Within this framework, neural entrainment to rhythmic structures supports the segmentation of speech, the perception of stress patterns, and the development of fluent prosody.

While previous research has demonstrated these mechanisms primarily through experimental and neurophysiological methods (Goswami *et al.*, 2013; Power *et al.*, 2016), the present study extends this body of work by providing ecologically grounded evidence from preschool classrooms. Educators' reports of improved rhythmic speech production, chanting

accuracy, and responsiveness to prosodic cues suggest that rhythmic sensitivity can be cultivated through everyday pedagogical practices embedded in routine classroom activities. In this sense, the study bridges a critical gap between laboratory-based evidence and classroom-based music pedagogy, illustrating how rhythm–language interactions are enacted in authentic educational contexts.

Educators' observations of enhanced attention, coordination, and engagement during rhythm-based activities further resonate with research on neural entrainment and auditory–motor coupling. Adam Tierney and colleagues have shown that rhythmic training strengthens synchronisation between auditory and motor systems, supporting temporal prediction and attentional regulation (Tierney & Kraus, 2013; Tierney *et al.*, 2015). Although the present study does not employ neurophysiological measures, participants' accounts of children increased bodily coordination, rhythmic movement, and sustained focus suggest the operation of similar entrainment mechanisms. From an embodied cognition perspective, rhythm-based activities integrate movement, sound, and speech, enabling children to experience temporal structures through the body as well as through auditory perception (Phillips-Silver & Trainor, 2007; Leman, 2016).

Another salient finding concerns the perceived differences between children who are systematically exposed to rhythm-based musical activities and those whose engagement is more limited or sporadic. Educators consistently associated regular rhythmic exposure with greater musical responsiveness, verbal expressiveness, and classroom participation. This aligns with developmental research emphasising early musical exposure as a critical factor shaping perceptual and cognitive pathways. Eleni Politimou and colleagues have demonstrated that early rhythmic and melodic experiences contribute to musical perception and may influence broader auditory processing abilities (Politimou *et al.*, 2019; Politimou & Stewart, 2020). The present study extends this literature by demonstrating that such developmental sensitivity is observable not only in controlled experimental contexts but also in educators' everyday pedagogical observations.

Beyond musical and linguistic outcomes, educators reported broader behavioural and social benefits associated with rhythm-based activities, including improved emotional regulation, group cohesion, and smoother transitions between classroom activities. These findings are theoretically grounded in Colwyn Trevarthen's concept of communicative musicality, which conceptualises rhythm, pulse, and expressive timing as foundational to human interaction and intersubjectivity (Trevarthen, 1999; Trevarthen & Malloch, 2002). From this perspective, rhythm functions not merely as a pedagogical tool but as a relational medium through which shared attention, turn-taking, and affective alignment are established. Educators' descriptions of rhythm facilitating collective engagement and behavioural regulation suggest that communicative musicality continues to shape interaction beyond infancy, structuring social learning within early childhood educational environments. Recent studies support this extension, highlighting rhythm's role in classroom regulation, social bonding, and inclusive participation (Custodero & Trevarthen, 2009; Barrett *et al.*, 2021).

Methodologically, the study's action research design is central to understanding these findings. Consistent with action research principles (Kemmis *et al.*, 2014), educators were

positioned as reflective practitioners who observed, adapted, and evaluated rhythm-based activities within their own pedagogical contexts. Rather than aiming for generalisable causal claims, the study prioritised pedagogical meaning, contextual relevance, and reflective insight. Within this framework, rhythm emerged as a flexible, low-threshold pedagogical resource capable of supporting multiple developmental domains simultaneously. Educators' confidence, prior training, and professional experience appeared to mediate the frequency and quality of rhythmic engagement, echoing research emphasising the role of teacher musical self-efficacy in classroom practice (Biasutti *et al.*, 2020; Bautista *et al.*, 2021).

Taken together, the findings position rhythm as a shared pedagogical principle linking musical, linguistic, and behavioural dimensions of early childhood learning. Rather than conceptualising rhythm as a specialised or supplementary intervention, the study highlights its potential as a foundational element of everyday educational practice. By integrating rhythm into routine classroom activities, educators create opportunities for embodied, inclusive, and developmentally appropriate learning experiences in which musical engagement reinforces linguistic expression and social interaction. In this way, the present study contributes to ongoing international discussions on music–language relationships and early childhood pedagogy by foregrounding rhythm as a mediating, relational, and pedagogically embedded phenomenon. Through its action research approach, the study complements experimental and neuroscientific research, offering a practice-based perspective that underscores the centrality of rhythm in early learning environments.

8. Conclusion

This study set out to explore the role of rhythm as a mediating factor in the development of musical and language-related skills in early childhood education, drawing on educators' perspectives and reflective practice within an action research framework. By examining how rhythm-based musical activities are perceived, implemented, and evaluated by preschool teachers and student teachers, the study contributes to a growing body of interdisciplinary research that positions rhythm as a shared cognitive, embodied, and communicative foundation linking music and language development in early childhood.

The findings of the study indicate that systematic exposure to rhythmic musical activities is perceived by educators as having a positive influence on children's musical engagement, attentional regulation, and language-related behaviours, particularly those associated with speech rhythm, phonological awareness, and expressive communication. Educators consistently reported that rhythm-based practices—such as clapping patterns, rhythmic movement, chant-like songs, and coordinated speech–movement activities—supported children's ability to attend, anticipate, and participate meaningfully in communicative interactions. These observations align with theoretical accounts that emphasise temporal structure, entrainment, and rhythmic synchronisation as core mechanisms underpinning both musical and linguistic processing.

Importantly, the study does not frame rhythm as an isolated variable or as a narrowly defined instructional technique. Instead, rhythm emerges as an organising pedagogical principle embedded within everyday classroom routines and embodied interactions. From this

perspective, rhythm operates not only as a musical element but also as a temporal scaffold that supports turn-taking, prosodic awareness, and shared intentionality in early communication. This finding reinforces theories of communicative musicality and rhythmic entrainment, which conceptualise early language development as grounded in rhythmic and affective exchanges long before the emergence of formal linguistic structures.

The action research design adopted in this study proved particularly valuable in capturing these dynamics. By foregrounding educators' situated knowledge and reflective insights, the research highlights how rhythm-based practices are negotiated within real educational contexts shaped by institutional constraints, classroom composition, and pedagogical experience. Rather than aiming for generalisable causal claims, the study prioritises pedagogical meaning and transferability, offering a nuanced understanding of how rhythm functions within authentic early childhood learning environments. In doing so, it complements experimental and neuroscientific research by demonstrating how theoretical constructs related to rhythm and language are enacted in practice.

From a pedagogical standpoint, the findings underscore the potential of rhythm-focused musical activities as inclusive and developmentally appropriate tools in early childhood education. Educators perceived rhythm-based practices as accessible to all children, regardless of linguistic background or prior musical experience, supporting participation, emotional engagement, and social interaction. This is particularly relevant in contemporary preschool settings characterised by linguistic diversity and varying developmental trajectories. By emphasising rhythm as a shared temporal and embodied resource, the study points towards pedagogical approaches that foster inclusion and holistic development rather than skill fragmentation.

At the same time, the study acknowledges its limitations. The small sample size and reliance on self-reported perceptions mean that the findings should be interpreted with caution. The absence of direct child-level measurements and longitudinal data limits the extent to which developmental outcomes can be empirically verified. However, within the epistemological orientation of action research, these limitations do not undermine the study's contribution; rather, they delineate its scope and purpose. The study offers depth of insight into educators' practices and reflections, providing a foundation for future research that may combine qualitative, quantitative, and longitudinal approaches.

Future research could build on these findings by examining rhythm-based pedagogical practices across larger and more diverse samples, incorporating observational and child-centred measures, and exploring the long-term impact of rhythmic engagement on language development. Interdisciplinary studies that integrate music education, linguistics, developmental psychology, and neuroscience would further enrich understanding of rhythm as a central mechanism in early learning. Additionally, professional development research could investigate how targeted training in rhythm-centred pedagogy influences educators' confidence and classroom practices over time.

In conclusion, this study reinforces the view that rhythm occupies a pivotal position at the intersection of music and language in early childhood education. By situating rhythm within everyday pedagogical practice and highlighting its embodied, relational, and inclusive

dimensions, the research contributes a practice-based perspective to international discussions on early learning. Rather than advocating for rhythm as a specialised intervention, the study positions it as a foundational element of early educational experience—one that supports communication, engagement, and learning in ways that are both developmentally meaningful and pedagogically sustainable.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Authors

Paraskevi Bika is a pre-graduate kindergarten teacher of the Department of Pre-School Education and Educational Design, School of Humanities, University of the Aegean. Her work approaches music and the arts as pedagogical dialogues that foster language-rich learning environments and enhance children's participation, attention, and meaning-making in early educational contexts.

Maria Argyriou (Post-doc, PhD) serves as Laboratory Teaching Staff in Applied Music Pedagogy at the Department of Preschool Education and Educational Design, School of Humanities, University of the Aegean (Rhodes, Greece). She holds a PhD in Cultural Policy and Music Education from the Department of Music Studies at the Ionian University, as well as a Master's degree in Education from the Hellenic Open University and a second Master's in Educational Leadership and School Unit Evaluation. She is Co-Editor of the open-access journal Hellenic Journal of Music, Education, and Culture (http://hejmec.eu/journal/index.php/HeJMEC), and Editor of the music pedagogical open journal "Music in the First Grade" (http://mspv.aegean.gr/), Aegean University Editions.

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