Contents lists available at ASI

Acta Scientiae et Intellectus
Journal of Sport Sciences

Homepage: www.actaint.com

Research Article

Bibliometric Analysis and Thematic Evolution of Music Theory Concepts in Dance Research

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Abstract

Music and dance are closely connected through rhythm, meter, groove, musicality, entrainment, and other forms of temporal and embodied organization. Despite growing interdisciplinary interest in these relationships, the scientific development and thematic organization of music theory concepts within dance research have not been comprehensively mapped. Bibliographic data were retrieved from the Web of Science Core Collection on 7 October 2026 using a predefined Topic search strategy combining dance-related terms with music-theoretical concepts. After document-type filtering, duplicate assessment, and retraction control, 353 Articles and Review Articles published between 1980 and 2026 constituted the final dataset. Bibliometric and science-mapping analyses were conducted in R using the bibliometrix package and included performance analysis, cleaned Author Keyword frequency and co-occurrence analysis, thematic mapping, thematic evolution, and reference co-citation analysis. Publication output increased markedly from the mid-2010s onward. Rhythm, groove, movement, musicality, and entrainment were among the most prominent cleaned Author Keywords. Thematic mapping identified entrainment, sensorimotor synchronization, and music cognition as motor themes, while rhythm, groove, movement, perception, and embodiment occupied central positions within the conceptual structure. Thematic evolution indicated a progression from an initially music-centered configuration toward a more differentiated structure involving rhythm, sensorimotor synchronization, choreography, musicality, entrainment, syncopation, and groove. Reference co-citation analysis revealed two major interconnected intellectual groupings broadly reflecting groove-movement research and beat-meter-synchronization research. Music theory-related dance research increasingly reflects an integrated perspective linking musical structure, perception, embodiment, and sensorimotor coordination. Rhythm appears to function as a central conceptual bridge between music and dance, while groove, entrainment, musicality, and synchronization represent key themes shaping the field's recent conceptual development.

Keywords: Bibliometric analysis, dance, groove, music theory, rhythm

INTRODUCTION

Dance and music are two performative domains that are closely interconnected in terms of temporal organization, movement, and expression. The relationship between musical structures and dance extends beyond a merely accompanying function; rhythmic patterns, formal divisions, and expressive features are directly associated with the organization of movement. Experimental studies have demonstrated structural and expressive correspondences between music and dance, as well as shared dynamic properties between music and movement (Krumhansl & Schenck, 1997; Sievers et al., 2013). Similar relationships have also been identified across different dance traditions through connections between rhythmic and metrical organization and bodily movement (Simpson-Litke & Stover, 2019; Haugen, 2021; Charnavel, 2023). This interaction indicates that musical elements occupy a central role in understanding the temporal and structural organization of dance.

Rhythm, meter, syncopation, and groove constitute key musical concepts through which the relationship between music and dance can be understood. Rhythm, tempo, and meter provide temporal frameworks for movement, whereas groove and syncopation are closely associated with the urge to move and bodily entrainment (Fitch, 2016; Levitin et al., 2018). Empirical findings further show that metrical hierarchies can be embodied through movement at different temporal levels and that moderate levels of syncopation can enhance both pleasure and the desire to move (Witek et al., 2014; Toiviainen & Carlson, 2022). Groove perception is also associated with beat sensitivity, musical experience, and social dance experience, indicating that responses to musical structure are shaped by both acoustic and experiential factors (O'Connell et al., 2022). Together, these concepts provide a theoretical basis for examining how musical organization is perceived and embodied through dance.

Rhythmic entrainment and sensorimotor synchronization provide an important basis for understanding the relationship between musical structure and bodily movement. Sensorimotor synchronization refers to the temporal coordination of movement with external rhythmic events, and research has shown that this process is closely associated with predictive timing and neural entrainment mechanisms (Repp & Su, 2013; Nozaradan et al., 2016). In dance, these mechanisms extend to full-body coordination, where musical context can influence movement timing and anticipation, as demonstrated in classical ballet performance (Talebi et al., 2023). From an embodied cognition perspective, bodily action does not merely respond to music but

can also influence how musical events are perceived and interpreted (Maes et al., 2014). Consistent with this perspective, characteristics of music-induced movement have been shown to vary systematically with rhythmic and timbral features of music (Burger et al., 2013). Together, these findings identify entrainment, sensorimotor synchronization, and embodied perception as key processes connecting musical organization with dance movement.

Although existing bibliometric studies have mapped several subfields of dance and music research, their scope has largely focused on dance medicine and science, rehabilitation, dance therapy, music psychology, and core music theory literature (Duinker & Léveillé Gauvin, 2017; Anglada-Tort & Sanfilippo, 2019; Brown-Appenzeller et al., 2026; Yang et al., 2026). In contrast, bibliometric research examining the scientific development, intellectual structure, and thematic evolution of rhythm, meter, syncopation, groove, musicality, and related music-theoretical concepts within dance research remains limited. This gap highlights the need for a systematic examination of how the theoretical relationship between music and dance has developed over time and how its major concepts have been organized within the literature. Accordingly, the present study aims to map the scientific development, influential sources and contributors, conceptual clusters, intellectual structure, and thematic evolution of music theory concepts in dance research using bibliometric and science-mapping methods applied to publications indexed in the Web of Science Core Collection.

METHOD

Research Design

This study employed a bibliometric and science-mapping design to examine the scientific development, intellectual structure, conceptual organization, and thematic evolution of music theory concepts in dance research. Bibliometric analysis enables the systematic evaluation of publication patterns, influential authors and sources, citation relationships, collaboration structures, and the conceptual development of a research field, whereas science-mapping techniques facilitate the visualization and interpretation of the intellectual, social, and conceptual structures underlying a body of literature (Zupic & Čater, 2015; Donthu et al., 2021). Accordingly, the present study used complementary performance and science-mapping techniques to identify major research trends, influential contributors, thematic clusters, and changes in the conceptual structure of the field over time. The identification, filtering, and final selection of records were documented using a PRISMA 2020-informed procedure to enhance transparency and reproducibility in database searching, document-type filtering, duplicate assessment, retraction control, and final inclusion (Page et al., 2021).

Data Source and Search Strategy

Bibliographic data were retrieved from the Web of Science Core Collection (WoSCC) on 7 October 2026. All available editions within WoSCC were included in the search. No initial restrictions were imposed on publication year or language in order to capture the broadest possible historical development of the field.

The search strategy was developed iteratively to balance sensitivity and specificity. Preliminary searches indicated that broad combinations of dance-related terminology with isolated music-related terms retrieved a substantial number of technically oriented or conceptually peripheral records. Therefore, the search strategy was progressively refined to prioritize terms more directly associated with music theory and its intersection with dance, including musical structure, musical form, rhythm, meter, tempo, phrasing, groove, syncopation, musicality, and choreomusical analysis.

The final search was conducted in the Topic (TS) field of Web of Science using the following query:

> *TS=((dance OR dancing OR dancer* OR choreograph*) AND ("music theory" OR musicality OR choreomusical* OR "choreomusical analysis" OR "musical structure" OR "musical form" OR "musical rhythm" OR "musical meter" OR "musical metre" OR "rhythmic structure" OR "metrical structure" OR "metric structure" OR "musical tempo" OR "musical phrasing" OR syncopation OR groove)) NOT (robot* OR humanoid* OR "music information retrieval" OR "automatic recognition" OR "automatic discrimination")*

The truncation symbol (*) was used to retrieve lexical variants of selected search terms, whereas quotation marks were used to preserve multiword expressions as exact phrases. The exclusion block was applied to reduce records primarily concerned with humanoid robotics, automatic recognition or discrimination systems, and music information retrieval when these topics did not reflect the substantive theoretical relationship between music and dance. The final search yielded 415 records for subsequent document-type filtering and bibliometric data processing.

Eligibility Criteria

Records were considered eligible if they (1) were indexed in the Web of Science Core Collection; (2) were classified as an Article or Review Article; (3) matched the predefined Topic search strategy combining dance-related terms with music-theoretical concepts; (4) were not captured by the predefined exclusion terms targeting humanoid robotics, music information retrieval, and automatic recognition or discrimination; (5) contained sufficient bibliographic metadata for bibliometric analysis; and (6) were published in any language. No lower publication-year limit was imposed. Consequently, the eligible literature identified through the search covered the period from 1980 to 2026. Records were excluded if they were classified exclusively as proceeding papers, editorial materials, book reviews, meeting abstracts, news items, theater reviews, record reviews, or other non-article/non-review document types. Retracted publications were also excluded. The predefined exclusion terms were

applied at the search stage to reduce the retrieval of technically oriented records primarily related to humanoid robotics, music information retrieval, and automatic recognition or discrimination. Topical eligibility required that each publication address a substantive relationship between dance or human bodily movement and at least one of the predefined music-theoretical concepts represented in the search strategy. The mere occurrence of a dance-related term in the title, abstract, keywords, or indexed metadata was not considered sufficient for inclusion. Particular attention was given to records originating from music cognition, neuroscience, psychology, and computational research. Such records were retained only when dance, choreography, bodily movement, entrainment, movement synchronization, or the relationship between musical structure and bodily movement constituted a substantive component of the study's research question, analysis, or interpretation. Records in which dance-related terminology was merely incidental to an otherwise unrelated technical, computational, clinical, or perceptual topic were considered outside the conceptual scope of the study.

Study Selection and PRISMA Flow

The initial search of the Web of Science Core Collection yielded 415 records. Restricting the dataset to Articles and Review Articles reduced the number of records to 354. Duplicate records were assessed using DOI information and normalized article titles, and no duplicate records were identified. The remaining records were screened for topical relevance based on their titles, abstracts, Author Keywords, and available bibliographic metadata, using the eligibility criteria described above. The screening considered whether dance, choreography, bodily movement, or movement-related processes were substantively connected to the selected music-theoretical concepts rather than appearing only incidentally. No records were excluded during topical relevance screening. One retracted publication was subsequently identified and removed. Following document-type filtering, duplicate assessment, topical relevance screening, and retraction control, 353 records constituted the final analytical dataset. The study-selection process was documented using a PRISMA 2020-informed flow diagram (Page et al., 2021) and is presented in Figure 1.

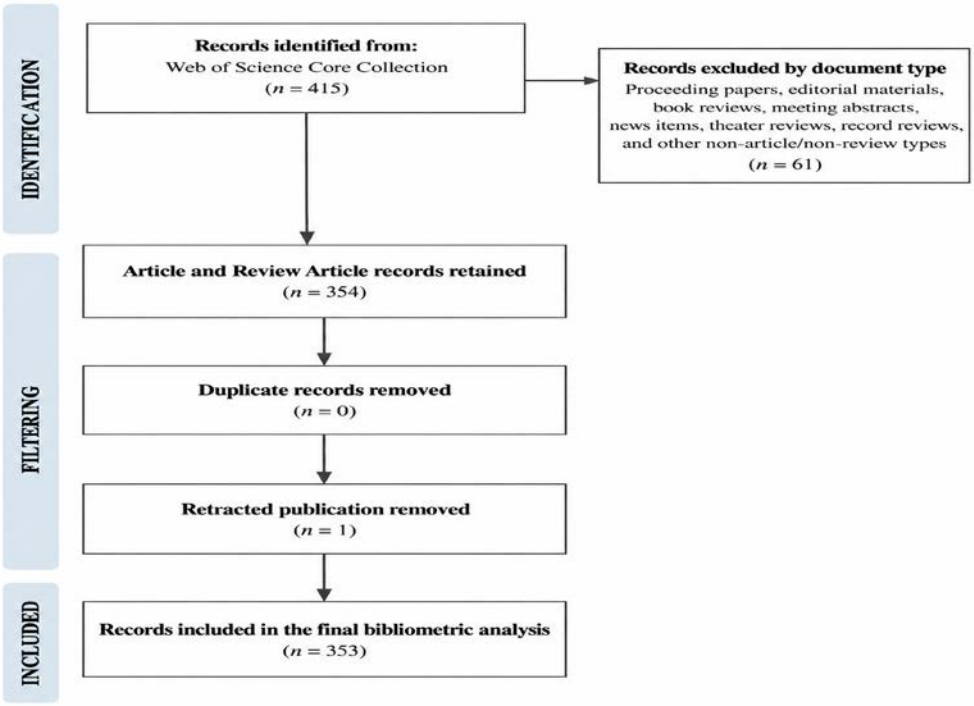

Figure 1. PRISMA 2020-informed flow diagram of record identification and selection.

Data Export

Following document-type filtering, the 354 records classified as Articles or Review Articles were exported from the Web of Science Core Collection in Plain Text File format using the Full Record and Cited References option. This export configuration was selected because it preserves the bibliographic and cited-reference metadata required for data cleaning, performance analysis, reference co-citation analysis, keyword-based conceptual mapping, and thematic analysis.

Data Preprocessing and Cleaning

Data preprocessing was conducted in R version 4.5.2 using the bibliometrix package (version 5.5.0), which provides an integrated environment for bibliometric data processing and science-mapping workflows (Aria & Cuccurullo, 2017). Before analysis, the imported dataset was systematically checked for the total number of records, publication-year consistency,

document-type classification, duplicate records, retracted publications, and missing bibliographic fields. Duplicate detection was performed using DOI information and normalized article titles to minimize the risk of repeated records entering the analytical dataset. The final analytical dataset contained no missing values for article titles, author names, publication years, or source titles. Missing values were observed in Author Keywords, Keywords Plus, and DOI fields; these records were retained because the absence of these metadata elements did not invalidate the bibliographic record or prevent its inclusion in the broader bibliometric analyses. One formally retracted publication was identified during data cleaning and removed before the bibliometric analyses were conducted.

Keyword Standardization

Because conceptual-structure and thematic analyses are sensitive to lexical variation, Author Keywords were standardized prior to analysis. The original keyword field was preserved, and a separate cleaned keyword field was generated to maintain the integrity of the raw bibliographic data. Keyword harmonization was performed conservatively. Only lexical variants that were judged to represent the same concept were merged, including spelling differences, punctuation inconsistencies, singular/plural variants, British/American spelling variants, obvious typographical errors, and equivalent abbreviations. Conceptually related but theoretically distinct terms were retained as separate entries to avoid artificially collapsing the conceptual structure of the field.

For example, *"dancing," "dances,"* and *"dance."* were standardized as *"dance"*; *"synchronisation"* was standardized as *"synchronization"*; *"musical metre"* was standardized as *"musical meter"*; and *"electronic dance music (EDM)"* was standardized as *"electronic dance music."*

Author Keywords were used as the primary conceptual field for keyword frequency and co-occurrence analysis, thematic mapping, and thematic evolution because they reflect the terminology explicitly assigned by the authors to represent the content of their publications. Keywords Plus were retained in the dataset as a complementary bibliographic field but were not used in the conceptual-structure analyses. Keyword standardization was applied only to the records retained in the final analytical dataset before conceptual-structure analyses were conducted.

Bibliometric Analysis

The analytical framework combined performance analysis and science-mapping techniques to examine the productivity, intellectual structure, and conceptual structure of the field (Zupic & Čater, 2015; Donthu et al., 2021). Performance analysis included annual scientific production, the most productive authors, the most relevant sources, the most relevant institutional affiliations, corresponding-author countries, single-country publications (SCP), multiple-country publications (MCP), and the most globally cited documents. The intellectual structure of the field was examined through reference co-citation analysis, which was used to identify groups of references frequently cited together (Zupic & Čater, 2015). The conceptual structure was examined primarily through cleaned Author Keywords and included keyword-frequency analysis, keyword co-occurrence analysis, thematic mapping, and thematic evolution. These analyses were used to identify dominant concepts, relationships among recurring terms, major thematic clusters, and longitudinal changes in the conceptual organization of the field (Cobo et al., 2011).

Thematic Mapping

Thematic mapping was conducted through co-word analysis using the cleaned Author Keywords. The identified themes were positioned according to their centrality and density values and classified into four quadrants: motor themes, basic themes, niche themes, and emerging or declining themes. Centrality represents the degree to which a theme is connected to other themes within the broader conceptual structure of the field, whereas density reflects the internal development and cohesion of the theme. This framework allows the strategic importance and level of development of major research themes to be evaluated simultaneously (Cobo et al., 2011).

Thematic Evolution

Thematic evolution analysis was conducted to examine how the major conceptual themes of the field developed and transformed over time. Because publication activity was relatively sparse in the earlier years and increased substantially in more recent periods, temporal intervals were not defined solely on the basis of equal calendar duration. Instead, the subperiods were determined by considering the annual publication distribution, chronological continuity, and the number of publications within each interval to ensure meaningful thematic comparison. The final analysis used the following time intervals: 1980-2009, 2010-2015, 2016-2020, and 2021-2026. The evolution of themes across successive periods was examined through shared keywords and thematic linkages. This procedure enabled the identification of persistent themes, newly emerging themes, converging or splitting thematic trajectories, and themes that weakened or disappeared over time. The analysis therefore provided a longitudinal view of the conceptual development of music theory-related research in dance.

Reproducibility

To enhance reproducibility, the database source, retrieval date, complete Web of Science search string, document-type restrictions, language policy, inclusion and exclusion criteria, data-cleaning procedures, and keyword-standardization rules were explicitly documented. The analytical workflow was designed to enable replication of the literature retrieval and

bibliometric procedures by future researchers using the same database, search strategy, and filtering criteria. Because Web of Science is continuously updated, minor differences in record counts may occur when the search is repeated at a later date.

FINDINGS

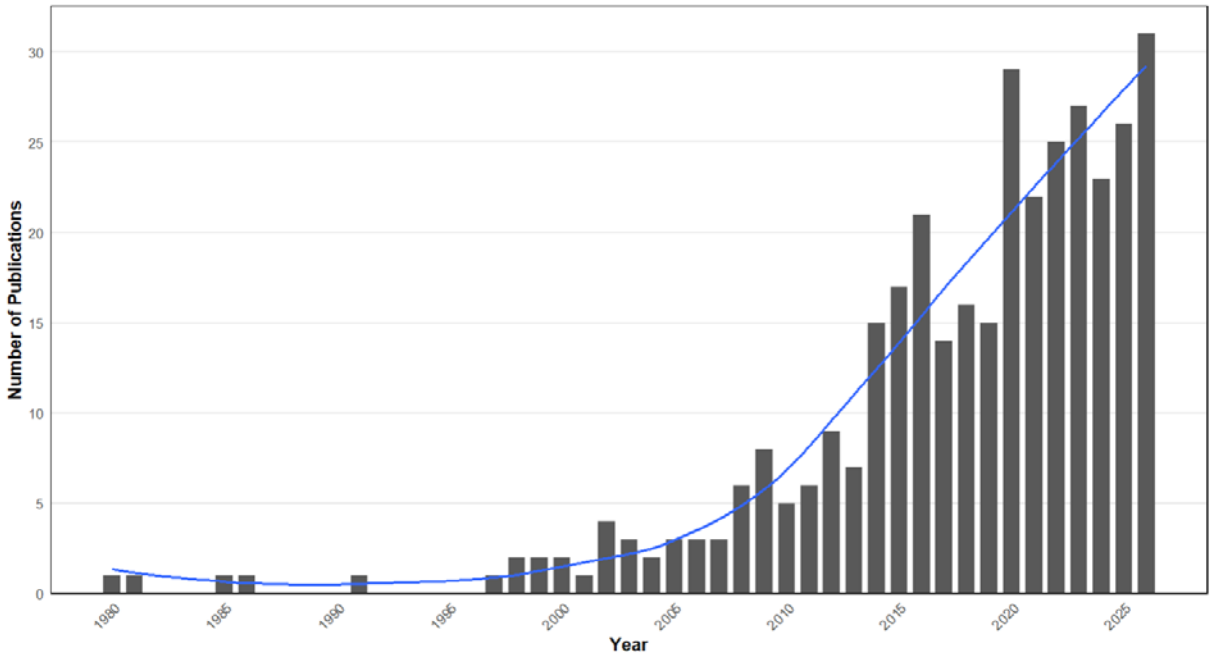

Figure 2. Annual scientific production in music theory-related dance research (1980-2026).

Figure 2 presents the annual distribution of publications included in the final bibliometric dataset. Scientific production was sparse and intermittent during the earlier years, followed by a gradual increase from the late 1990s and a more pronounced rise from the mid-2010s onward. Although annual publication counts fluctuated across recent years, the overall trajectory was upward, with the highest publication output occurring toward the end of the observation period. The smoothed trend line likewise indicates a sustained increase in publication activity over time. Because the search was conducted on 7 October 2026, the 2026 publication count represents a partial year and should be interpreted accordingly.

Table 1. Most relevant sources in music theory-related dance research

Rank	Source	Documents	% of total
1	Frontiers in Psychology	23	6.5
2	PLOS ONE	11	3.1
3	World of Music-New Series	11	3.1
4	Music Theory Online	9	2.5
5	Music Perception	8	2.3
6	Research in Dance Education	7	2.0
7	Dance Chronicle	4	1.1
8	Musicae Scientiae	4	1.1
9	Neuroscience and Biobehavioral Reviews	4	1.1
10	Popular Music	4	1.1

Table 1 presents the most relevant publication sources in the dataset. Frontiers in Psychology was the leading source with 23 publications (6.5% of the total dataset). PLOS ONE and World of Music-New Series followed with 11 publications each (3.1%), while Music Theory Online contributed nine publications (2.5%), Music Perception eight publications (2.3%), and Research in Dance Education seven publications (2.0%). Dance Chronicle, Musicae Scientiae, Neuroscience and Biobehavioral Reviews, and Popular Music each contributed four publications (1.1%). Overall, the leading sources represented multiple disciplinary areas, including psychology, music, dance, and neuroscience.

Table 2. Most productive authors in music theory-related dance research

Rank	Author	Documents	% of total
1	Vuust, P.	10	2.8
2	Hannon, E. E.	6	1.7
3	Stupacher, J.	6	1.7
4	Fitch, W. T.	4	1.1
5	Keller, P. E.	4	1.1
6	Nave-Blodgett, J. E.	4	1.1
7	Snyder, J. S.	4	1.1
8	Cirelli, L. K.	3	0.8
9	Danielsen, A.	3	0.8
10	Grahn, J. A.	3	0.8

Note. Percentages were calculated relative to the final analytical dataset (N = 353).

Table 2 presents the most productive authors in the dataset. Vuust P was the most productive author, appearing in 10 publications (2.8% of the final dataset). Hannon EE and Stupacher J followed with six publications each (1.7%). Fitch WT, Keller PE, Nave-Blodgett JE, and Snyder JS each appeared in four publications (1.1%), whereas Cirelli LK, Danielsen A, and Grahn JA each appeared in three publications (0.8%).

Table 3. Leading corresponding-author countries and international collaboration patterns

Rank	Country	Articles	SCP	MCP	MCP Ratio
1	USA	73	66	7	0.0959
2	United Kingdom	24	20	4	0.1667
3	China	21	15	6	0.2857
4	Canada	20	17	3	0.1500
5	Brazil	16	13	3	0.1875
6	Japan	12	11	1	0.0833
7	Spain	12	8	4	0.3333
8	Australia	11	9	2	0.1818
9	Austria	10	7	3	0.3000
10	Denmark	10	4	6	0.6000

Note. SCP = single-country publications; MCP = multiple-country publications; MCP Ratio = proportion of internationally co-authored publications among the country's corresponding-author publications.

Table 3 presents the leading corresponding-author countries and their international collaboration patterns. The USA had the highest number of publications, with 73 articles, including 66 single-country publications (SCP) and seven multiple-country publications (MCP). The United Kingdom followed with 24 publications, while China and Canada contributed 21 and 20 publications, respectively. Among the ten leading countries, Denmark had the highest MCP ratio (0.600), followed by Spain (0.333), Austria (0.300), and China (0.286). Japan (0.083) and the USA (0.096) showed the lowest MCP ratios among the top ten countries.

Table 4. Most relevant affiliations in music theory-related dance research

Rank	Affiliation	Documents
1	Aarhus University	11
2	University of Oslo	8
3	University of Oxford	7
4	University of Toronto	7
5	Harvard University	6
6	McMaster University	6
7	Nevada System of Higher Education (NSHE)	6
8	University of London	6
9	University of Nevada Las Vegas	6
10	Western Sydney University	6

Table 4 presents the most relevant institutional affiliations represented in the dataset. Aarhus University ranked first, appearing in 11 publications, followed by the University of Oslo with eight publications. The University of Oxford and the University of Toronto each appeared in seven publications. Harvard University, McMaster University, Nevada System of Higher Education (NSHE), the University of London, the University of Nevada Las Vegas, and Western Sydney University were each represented in six publications.

Table 5. Most globally cited documents in music theory-related dance research

Rank	Document	Year	Source	Total Citations	Citations per Year
1	*Syncopation, Body-Movement and Pleasure in Groove Music*	2014	PLOS ONE	292	22.46
2	*Beta-Band Oscillations Represent Auditory Beat and Its Metrical Hierarchy in Perception and Imagery*	2015	Journal of Neuroscience	167	13.92
3	*Music: A Link Between Cognition and Emotion*	2002	Current Directions in Psychological Science	163	6.52
4	*Experiencing Groove Induced by Music: Consistency and Phenomenology*	2006	Music Perception	155	7.38
5	*The Psychology of Music: Rhythm and Movement*	2018	Annual Review of Psychology	151	16.78
6	*Rhythmic Cognition in Humans and Animals: Distinguishing Meter and Pulse Perception*	2013	Frontiers in Systems Neuroscience	144	10.29
7	*Without It No Music: Beat Induction as a Fundamental Musical Trait*	2012	Neurosciences and Music IV: Learning and Memory	136	9.07
8	*Modeling the Tendency for Music to Induce Movement in Humans: First Correlations With Low-Level Audio Descriptors Across Music Genres*	2011	Journal of Experimental Psychology: Human Perception and Performance	130	8.12
9	*Chorusing, Synchrony, and the Evolutionary Functions of Rhythm*	2014	Frontiers in Psychology	127	9.77
10	*ChoreoMaster: Choreography-Oriented Music-Driven Dance Synthesis*	2021	ACM Transactions on Graphics	126	21.00

Table 5 presents the ten most globally cited documents in the final dataset. The most highly cited publication was *Syncopation, Body-Movement and Pleasure in Groove Music* (2014), with 292 citations and an average of 22.46 citations per year. This was followed by *Beta-Band Oscillations Represent Auditory Beat and Its Metrical Hierarchy in Perception and Imagery* (2015) with 167 citations, and *Music: A Link Between Cognition and Emotion* (2002) with 163 citations. Although *ChoreoMaster: Choreography-Oriented Music-Driven Dance Synthesis* ranked tenth in total citations (126), it had a comparatively high citation rate of 21.00 citations per year. The ten leading documents received between 126 and 292 global citations.

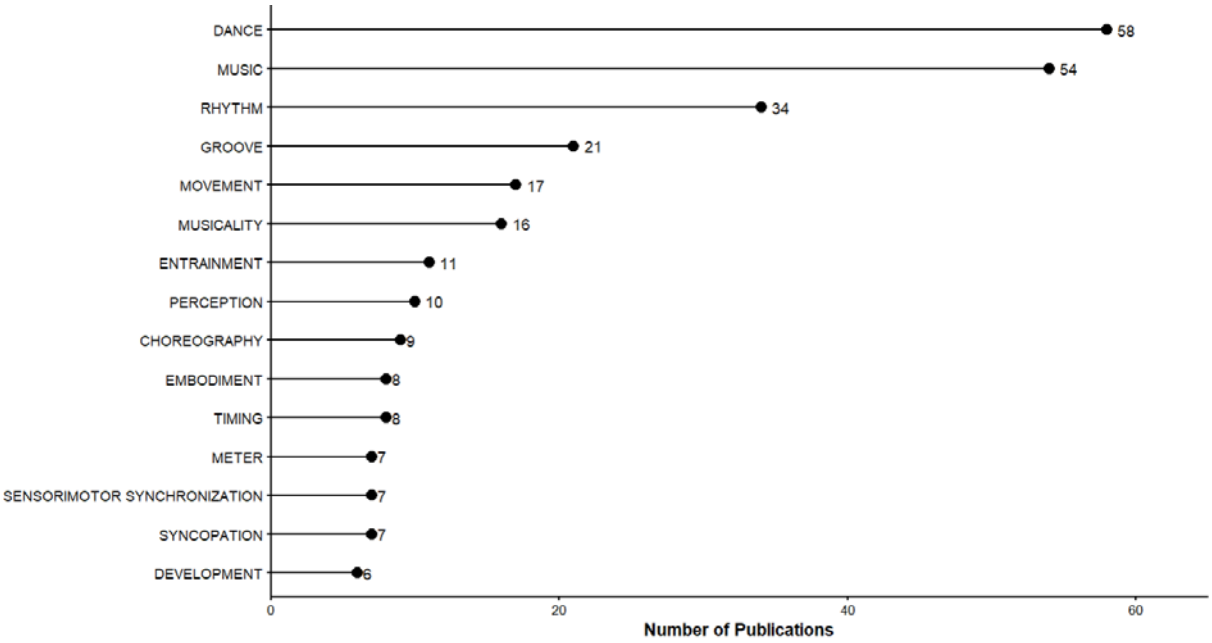

Figure 3. Most frequent cleaned Author Keywords in music theory-related dance research.

Figure 3 displays the most frequent cleaned Author Keywords in the final dataset. The most common keyword was *dance* (n = 58), followed by *music* (n = 54) and *rhythm* (n = 34). Other prominent keywords included *groove* (n = 21), *movement* (n = 17), and *musicality* (n = 16). Additional recurring terms were *entrainment* (n = 11), *perception* (n = 10), *choreography* (n = 9), and *embodiment* (n = 8). Overall, the keyword distribution indicates a strong conceptual emphasis on rhythm-related, movement-related, and embodied dimensions of music-dance research.

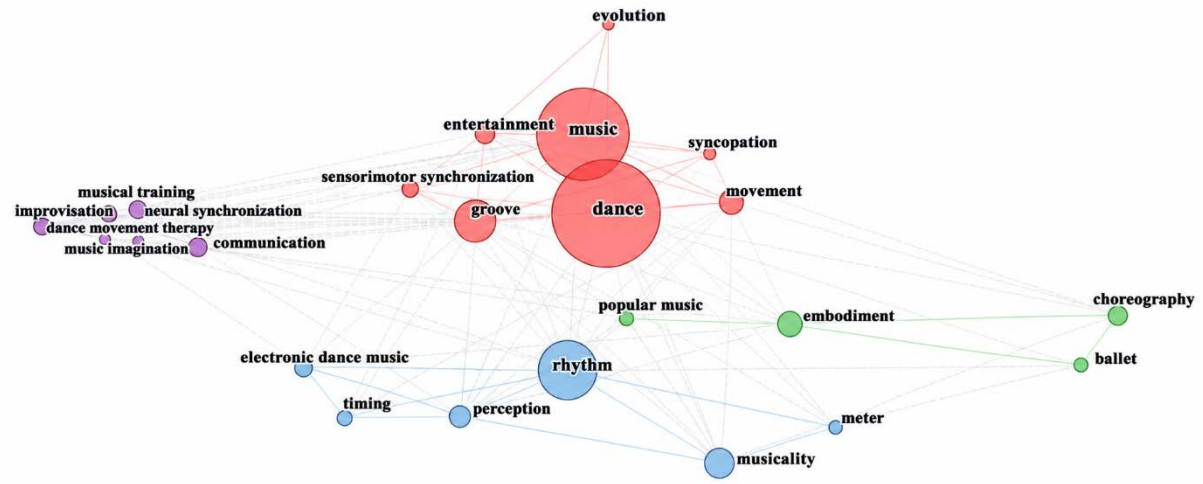

Figure 4. Keyword co-occurrence network based on cleaned Author Keywords in music theory-related dance research.

Figure 4 presents the keyword co-occurrence network constructed from cleaned Author Keywords. Node size represents keyword frequency, whereas links indicate co-occurrence relationships between keywords. Colors distinguish clusters identified by the network analysis. Three major thematic clusters were evident, together with a smaller peripheral grouping. The first major cluster was centered on dance and music and included groove, entrainment, sensorimotor synchronization, syncopation, movement, and evolution. The second was organized around rhythm and included perception, timing, musicality, meter, and electronic dance music. The third included embodiment, choreography, ballet, and popular music. A smaller peripheral grouping contained terms such as musical training, improvisation, dance therapy, interpersonal synchronization, communication, and neuroimaging. Overall, the network indicates an interconnected conceptual structure linking musical organization, rhythmic perception, movement, and embodied dimensions of dance.

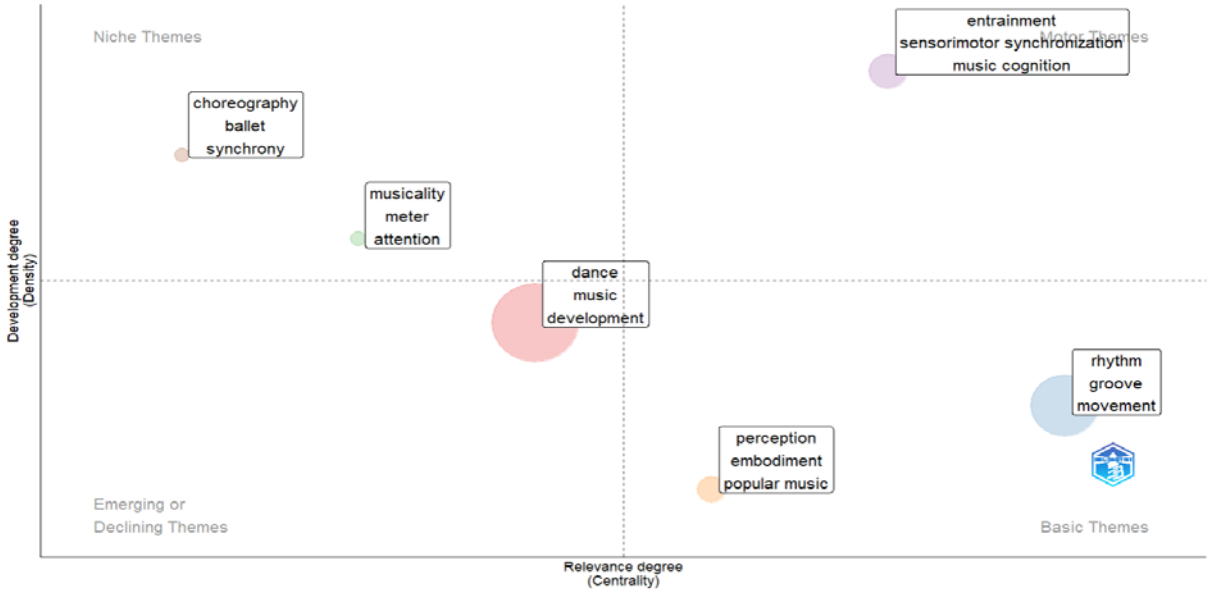

Figure 5. Thematic map of cleaned Author Keywords based on centrality and density.

Figure 5 presents the thematic map derived from cleaned Author Keywords according to centrality and density. Themes located in the upper-right quadrant were classified as motor themes, whereas those in the lower-right quadrant represented basic themes. Themes in the upper-left quadrant were identified as niche themes, while those in the lower-left quadrant represented emerging or declining themes. The motor-theme quadrant included a cluster centered on *entrainment*, *sensorimotor synchronization*, and *music cognition*. The basic-theme quadrant contained clusters centered on *rhythm*, *groove*, and *movement*, as well as *perception*, *embodiment*, and *popular music*. The niche-theme quadrant included clusters related to *choreography*, *ballet*, and *synchrony*, together with another cluster involving *musicality*, *meter*, and *attention*. The cluster centered on *dance*, *music*, and *development* was positioned in the emerging-or-declining quadrant, close to the centrality and density thresholds.

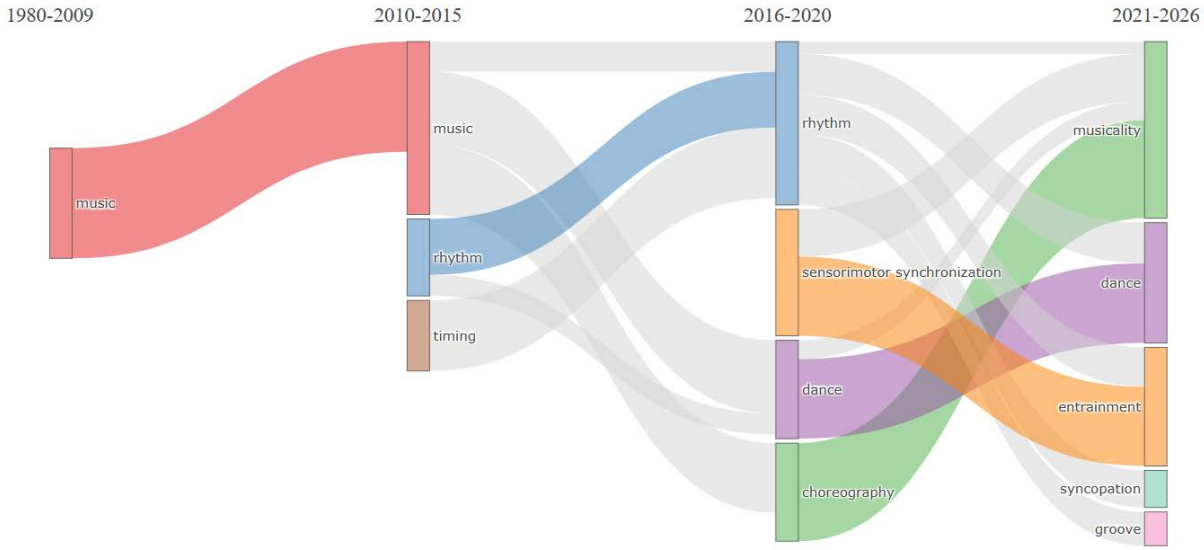

Figure 6. Thematic evolution of cleaned Author Keywords across four temporal periods (1980-2026).

Figure 6 illustrates the thematic evolution of cleaned Author Keywords across four temporal periods: 1980-2009, 2010-2015, 2016-2020, and 2021-2026. In the earliest period, *music* was the only theme retained in the thematic-evolution solution. During 2010-2015, the thematic structure became more differentiated, with *music*, *rhythm*, and *timing* represented as distinct themes. In 2016-2020, the thematic configuration expanded to include *rhythm*, *sensorimotor synchronization*, *dance*, and *choreography*. In the most recent period (2021-2026), the thematic structure was further differentiated, with *musicality*, *dance*, *entrainment*, *syncopation*, and *groove* represented as distinct themes. The thematic linkages across periods indicate a transition from an initially music-centered configuration toward a broader conceptual structure encompassing rhythm, sensorimotor synchronization, dance, musicality, entrainment, syncopation, and groove.

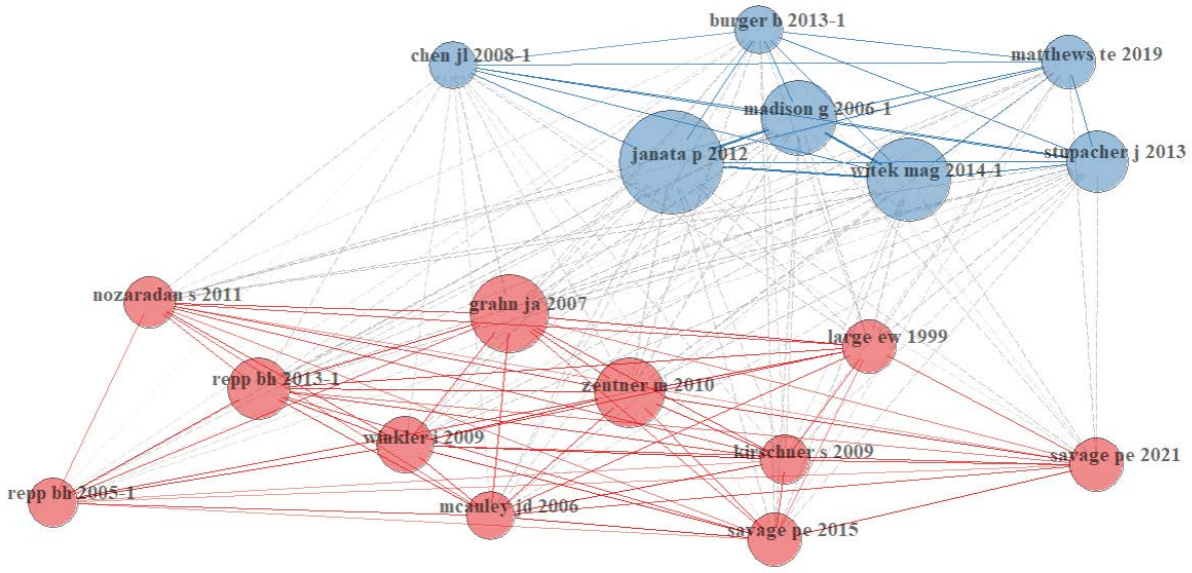

Figure 7. Reference co-citation network in music theory-related dance research.

Figure 7 presents the reference co-citation network of the leading cited references in the dataset. Node size represents the relative prominence of references within the plotted network, whereas links indicate co-citation relationships between references. The network displays two visually distinct major clusters. One cluster includes references such as Janata et al. (2012), Witek et al. (2014), Madison (2006), Stupacher et al. (2013), Chen et al. (2008), and Burger et al. (2013). The second cluster includes Grahn and Brett (2007), Zentner and Eerola (2010), Repp (2005), Winkler et al. (2009), Large and Jones (1999), Kirschner and Tomasello (2009), and Savage et al. (2015, 2021). The presence of links within and between these clusters indicates two major but interconnected co-citation groupings within the intellectual structure of the field.

DISCUSSION AND CONCLUSION

The increase in publication output indicates that research on music-theoretical concepts in dance has gained greater scholarly attention over time. This pattern is consistent with the broader expansion of both dance science and music psychology, where recent bibliometric studies have reported increasing publication activity and growing interdisciplinary engagement (Ho & Ho, 2015; Anglada-Tort & Sanfilippo, 2019; Brown-Appenzeller et al., 2026). The trend observed here therefore suggests that the music-dance relationship is increasingly being examined within an interdisciplinary research space linking musical structure, movement, cognition, and performance. Gordon and Lense (2020) similarly emphasized the interdisciplinary character of contemporary music cognition research, supporting the view that the recent growth in this literature reflects stronger connections between artistic, behavioral, and scientific perspectives.

The prominence of rhythm, groove, movement, musicality, and entrainment in the keyword analyses suggests that the conceptual structure of the field is strongly organized around the temporal and embodied relationship between music and dance. This pattern is consistent with previous research showing that rhythm, meter, and groove provide important temporal cues for movement and that rhythmic structure can shape the urge to move (Witek et al., 2014; Fitch, 2016; Levitin et al., 2018). The centrality of movement-related concepts is further supported by evidence that rhythmic and timbral properties of music are associated with characteristics of music-induced movement (Burger et al., 2013). The prominence of musicality and entrainment also points to broader perceptual and sensorimotor dimensions of the music-dance relationship, as musical and dance experience are associated with groove perception, while rhythmic and musical cues contribute to movement synchronization in dance (Su, 2016; O'Connell et al., 2022; Talebi et al., 2023). Overall, these findings suggest that the conceptual organization of the literature is centered on the perception, embodiment, and coordination of musical structure through dance movement.

The thematic evolution of the literature indicates that broad themes related to music and rhythm were increasingly accompanied by more specific sensorimotor, embodied, and predictive perspectives on the music-dance relationship. This pattern is consistent with sensorimotor synchronization research highlighting predictive timing, auditory-motor coupling, and coordination with external rhythmic events (Repp & Su, 2013). Embodied music cognition further supports this development by conceptualizing musical perception as closely linked to bodily action and sensorimotor prediction rather than as a purely auditory process (Maes et al., 2014; Maes, 2016). The more recent prominence of groove, syncopation, and entrainment also aligns with evidence showing that groove reflects an interaction between rhythmic predictability and surprise and involves perceptual, motor, and reward-related processes (Stupacher et al., 2022; Etani et al., 2024). Recent work on predictive timing further shows that music listening can engage motor-related processes even without overt movement, reinforcing the connection between musical structure and embodied action (Zalta et al., 2024). Overall, the thematic development observed in the present analysis suggests an increasingly integrated perspective in which rhythm is examined through perception-action coupling, prediction, embodiment, and movement coordination.

The reference co-citation network reveals two prominent and interconnected lines of inquiry within the intellectual structure of the field. One line centers on groove, syncopation, pleasure, and music-induced movement, reflecting research that links rhythmic structure with the urge to move, sensorimotor coupling, and embodied responses to music (Janata et al., 2012; Burger et al., 2013; Witek et al., 2014). The second line is more closely associated with beat and meter perception, neuronal entrainment, and sensorimotor synchronization, emphasizing the perceptual and neural mechanisms through which listeners anticipate and coordinate with rhythmic events (Nozaradan et al., 2012; Large et al., 2015; Nozaradan et al., 2016). The links between these co-citation groupings suggest that groove-related movement research and beat-meter synchronization research represent complementary strands within a broader intellectual structure connecting musical rhythm, perception, and bodily coordination.

Taken together, the findings suggest that research on music-theoretical concepts in dance is characterized by increasing interdisciplinary engagement and conceptual integration. Across the analyses, rhythm emerged as a central organizing concept, while groove, musicality, entrainment, sensorimotor synchronization, and embodied movement formed the main conceptual and intellectual connections within the literature. The thematic and co-citation patterns further indicate that structural aspects of music are increasingly being examined alongside perceptual, cognitive, neural, and bodily dimensions of dance. Overall, these patterns support an integrated view of music and dance as closely connected domains of temporal organization, perception, and movement.

Conclusion

This bibliometric analysis shows that research connecting music-theoretical concepts with dance is characterized by a set of recurring themes centered on rhythm, groove, musicality, entrainment, and movement. The results indicate that the literature increasingly connects structural features of music with perceptual, sensorimotor, cognitive, and embodied dimensions of dance. Thematic and co-citation patterns further suggest that groove-related movement research and beat-meter synchronization research represent closely connected strands within the intellectual structure of the field. These findings highlight rhythm as a central conceptual link between musical organization and dance movement and point to the growing relevance of embodied and sensorimotor perspectives in understanding this relationship. Overall, the study provides a structured overview of how music-theoretical concepts are represented within dance research and offers a bibliometric basis for future investigations of the relationship between musical structure, perception, and movement.

Recommendations

Future studies may extend the present mapping by incorporating additional databases such as Scopus, as well as books, book chapters, and practice-oriented outlets, in order to capture a broader portion of the literature on music theory concepts in dance. Combining bibliometric approaches with qualitative or choreomusical analyses may further clarify how concepts such as rhythm, groove, musicality, and entrainment are operationalized in empirical and artistic contexts. In addition, dance education and training programs may benefit from integrating these concepts more explicitly into curricula that address the relationship between musical structure and movement.

Limitations and strengths

A major strength of the present study is its focused examination of how music-theoretical concepts are represented within dance research. By combining publication trends, cleaned Author Keyword analysis, thematic mapping, thematic evolution, and reference co-citation analysis, the study provides an integrated overview of the conceptual and intellectual development of the field. The interdisciplinary nature of the search strategy should, however, be considered when interpreting the findings, as concepts such as rhythm, groove, musicality, entrainment, and movement are also shared with adjacent fields such as music cognition, neuroscience, and technology-oriented research.

Several limitations should also be acknowledged. The analysis was restricted to publications indexed in the Web of Science Core Collection, and relevant studies published in other databases, books, book chapters, or practice-oriented outlets may not have been captured. In addition, the predefined search strategy and the absence of Author Keywords in some records may have influenced the representation of less frequently indexed concepts. Finally, the 2026 publication count represents a partial year because the search was conducted on 7 October 2026.

Ethical statement

This study is based entirely on publicly available bibliographic data retrieved from the Web of Science Core Collection and does not involve human or animal subjects. Therefore, ethical approval was not required.

CRediT authorship contribution statement

Ercan Baş: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Project administration.

Data availability

The bibliographic data analyzed in this study were retrieved from the Web of Science Core Collection using the search strategy reported in the Method section. The processed dataset is available from the author upon reasonable request.

Declaration of competing interest

The author declares that there are no known competing financial interests or personal relationships that could have appeared to influence the study reported in this paper.

Acknowledgment

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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