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MAPPING EIGHT DECADES OF MUSICAL CREATIVITY RESEARCH: A BIBLIOMETRIC ANALYSIS OF INTELLECTUAL STRUCTURES, GLOBAL TRENDS, AND EMERGING FRONTIERS (1939–2025)

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Abstract

This study provides a comprehensive bibliometric analysis of musical creativity research spanning 1939 to 2025. Drawing on data from the Web of Science Core Collection, 1,205 peer-reviewed journal articles were analyzed using CiteSpace and Bibliometrix to trace the intellectual evolution, thematic organization, and global distribution of the field. The analysis reveals three major phases of development: an early period of scattered, individual-focused studies; a consolidation phase beginning in the early 2000s marked by educational and cognitive research growth; and a recent diversification phase driven by technological innovation and interdisciplinary methods. Core thematic clusters include cognitive and neuroscientific approaches, pedagogical models, music therapy, collaborative creativity, and emerging technological paradigms. Citation burst analysis identifies artificial intelligence, computational creativity, and music education as recent research frontiers, reflecting shifts toward digital mediation and neurocognitive inquiry. Geographically, research production is concentrated in North America and Western Europe, with growing but uneven contributions from Asia and Eastern Europe. International collaborations are expanding, though structural inequalities persist. The findings highlight a field that has matured into a dynamic interdisciplinary domain, while also revealing gaps in cross-cultural representation, methodological inclusivity, and integration of emerging technologies. Future research should expand multilingual coverage, adopt cross-regional comparative designs, and develop frameworks for evaluating human–machine co-creativity. This study provides the most comprehensive longitudinal overview of musical creativity scholarship to date, offering insights into its historical foundations, current structure, and likely future trajectories.

Keywords: Musical creativity; Bibliometric analysis; Intellectual structure; Interdisciplinary research; Artificial intelligence; Global research trends

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INTRODUCTION

Musical creativity is a vibrant and multifaceted field that has attracted sustained scholarly attention across cognitive science, psychology, music education, neuroscience, and artificial intelligence (Deliège & Wiggins, 2006; Biasutti, 2015; Palhares et al., 2024). Its importance is reflected in the steady growth of research output, the adoption of new methods, and the broadening of thematic focus over the past three decades. Early studies often examined isolated factors such as motivation, cognitive ability, or emotional response, without fully accounting for the social and cultural contexts that shape musical creativity (Schiavio & Benedek, 2020; Kozbelt, 2020).

Over time, researchers have moved toward more integrated approaches. Interdisciplinary work now connects psychological theory with educational practice and cultural context. Multifactorial models that include individual, collective, and technological perspectives illustrate the interplay between domain-specific and domain-general processes in creative music-making (Ben et al., 2025). Drawing on philosophy, computer modeling, experimental psychology, music education, neuroscience, and therapy, the field now examines creativity across composition, improvisation, digital production, and music therapy in a more holistic way (Deliège & Wiggins, 2006; Palhares et al., 2024).

Bibliometric trends reflect this evolution. From 1990 to 2022, the number of publications and citations rose sharply, supported by advances in technology and digitalization, which increased access to research resources and enabled new forms of analysis (Ozenc-Ira, 2023). After a temporary decline during the COVID-19 pandemic, research activity recovered quickly through virtual collaboration and data-driven methods. Citation peaks in 2018 highlight the influence of key contributions, while more recent work is still building citation impact. The field is characterized by thematic diversity. Bibliometric mapping identifies major clusters around computational creativity, improvisation, music therapy, education, and music technology, linked through interdisciplinary collaborations spanning neuroscience, psychology, computer science, and the arts (Yujia et al., 2024). Digital tools and artificial intelligence have played a central role in shaping new modes of collaboration and creative problem-solving (Ben et al., 2025).

Despite vigorous progress, several gaps in the bibliometric landscape of musical creativity research persist. A significant limitation is that few studies have systematically addressed the impact of post-COVID-19 developments, especially the ways in which virtual collaboration and digital platforms have transformed creative output (Chmiel et al., 2022). Likewise, while keyword burst analysis and thematic tracking are essential for identifying emergent frontiers and new research niches, these approaches remain underutilized (Zheng et al., 2025). There also remains a lack of comprehensive mapping of geographical distribution, with certain regions, topics, collaborative networks, and marginalized communities still underrepresented. Moreover, as the field integrates computational creativity, interdisciplinary models, and non-Western perspectives, sustained attention to the evolution of conceptual and methodological frameworks is required. The ongoing development of collaborative networks, digital methodologies, and inclusive educational practices is essential for overcoming fragmentation and advancing a more holistic, globally relevant understanding of musical creativity (Lage-Gómez et al., 2024).

Although the field has matured, existing research remains fragmented across disciplines, time periods, and regions. Prior reviews have typically been narrow in focus or limited in scope. This study addresses these gaps by conducting a comprehensive bibliometric analysis of musical creativity scholarship from 1939 to 2025. It maps

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intellectual structures, thematic clusters, global patterns, and emerging trends to provide a consolidated foundation for future research.

LITERATURE REVIEW

Defining Musical Creativity and Its Significance

Musical creativity refers to the ability to produce original musical ideas and expressions through composition, improvisation, performance, and collaborative engagement. It encompasses both the process and the product of creative activity. Webster (2002) conceptualized musical creativity as a dynamic process involving convergent and divergent thinking, resulting in musical products that reflect originality and value. Kokotsaki and Newton (2015) emphasized that musical creativity involves cognitive, emotional, and behavioral components that interact to produce new musical expressions. Historical perspectives on musical creativity have alternated between individualist and collectivist views. The individualist approach focuses on the psychological traits and abilities of exceptional individuals, often described as musical geniuses, whereas the collectivist approach emphasizes creativity as a social and cultural process shaped by interaction and collaboration (Burnard, 2012; Odena, 2012).

The significance of musical creativity extends beyond artistic production. It plays a crucial role in cognitive development, emotional regulation, and social interaction (Schiavio et al., 2022). In educational contexts, creative engagement through music fosters flexible thinking, problem-solving, and self-expression, which are essential skills in contemporary learning environments (Huovinen, 2021). In therapeutic settings, musical creativity contributes to wellbeing, rehabilitation, and emotional expression. Because it connects cognitive, cultural, and emotional dimensions, musical creativity has become a central topic in interdisciplinary research, linking musicology, psychology, education, neuroscience, and technology studies.

Bibliometric analysis provides an effective method for systematically mapping the development of research on musical creativity. By examining publication patterns, citation structures, co-authorship networks, and keyword co-occurrences, bibliometric methods reveal intellectual structures and thematic trends that are difficult to detect through traditional reviews (Anglada-Tort & Sanfilippo, 2019). These analyses rely on databases such as Scopus and Web of Science and use tools like, Bibliometrix, and CiteSpace to visualize networks and identify emerging research fronts.

Annual Scientific Production and Citation Trends

Research on musical creativity emerged in the early 20th century, although publications were limited and primarily focused on music education and psychological assessment. The 1970s and 1980s saw steady growth in publication output, driven by developments in cognitive psychology and educational reforms that emphasized creativity in learning. During this period, key theoretical models were developed, including Webster's (2002) framework for creative thinking in music. These early studies established musical creativity as a distinct area within the broader field of creativity research. A marked increase in publication activity occurred during the 1990s and early 2000s. The digitization of academic publishing, the expansion of indexing databases, and greater international academic exchange facilitated the dissemination of research (Hernández-Torrano & Ibrayeva, 2020). Educational policy initiatives promoting creativity as a core competency, especially within European contexts, also contributed to growth (De-Marchis & Shchebetenko, 2022). Methodological innovation, particularly the incorporation of

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neuroimaging and computational modeling, expanded the field beyond traditional music education and psychology.

Since 2010, the volume of publications on musical creativity has increased exponentially. Vicente-Nicolás and Sánchez-Marroquí (2024) documented sharp rises in both publication and citation counts across subfields such as creative pedagogy, cognitive neuroscience, and technology-mediated creativity. Highly cited works include neuroscientific studies investigating the neural basis of improvisation and composition (Limb & Braun, 2008), as well as research on collaborative creativity and the role of technology in creative practices. The COVID-19 pandemic produced a significant surge in research output between 2020 and 2022, as scholars examined virtual collaboration, online music education, and digital creative adaptation during periods of physical distancing (Benford et al., 2021). Citation bursts during this period indicate rapid scholarly engagement with these emerging themes.

Intellectual Structures, Thematic Clusters, and Interdisciplinary Connections

Bibliometric mapping of the musical creativity literature has revealed several major thematic clusters that structure the field. The first cluster focuses on cognitive and neuroscientific investigations of creative processes. Studies in this cluster analyze memory, attention, executive functions, and neural mechanisms underlying musical invention. Limb and Braun (2008) demonstrated how improvisation activates brain regions associated with self-expression and suppresses those involved in self-monitoring, highlighting the neural dynamics of spontaneous creativity. The second cluster centers on pedagogical approaches to fostering creativity in formal and informal educational contexts. Researchers have examined how teachers design learning environments that support improvisation, composition, and student agency (Kokotsaki & Kanellopoulos, 2015). Webster (2016) analyzed how creative thinking can be cultivated through classroom practices and curriculum design, emphasizing interaction and reflection as key components.

The third cluster involves music therapy and wellbeing. Diaz and Silveira (2014) conducted a bibliometric analysis showing how music's affective and therapeutic dimensions have become a growing research focus. Creativity in therapeutic contexts has been linked to emotional expression, rehabilitation, and mental health improvement. The fourth cluster examines collaborative and group creativity. Sawyer (2006) highlighted how collective improvisation in ensemble settings generates emergent structures through distributed cognition, where creativity arises from interaction among participants rather than isolated individual action. The fifth cluster is emerging around technological mediation. Research in this area investigates the role of artificial intelligence, algorithmic composition, digital production tools, and online platforms in shaping creative processes (Mycka & Mańdziuk, 2025). Civit et al. (2022) reviewed AI-based music generation systems, such as OpenAI's MuseNet and Google Magenta, noting their implications for authorship, originality, and human–machine interaction.

Keyword co-occurrence analyses show strong conceptual links between these clusters. Terms like "improvisation," "composition," "education," "emotion," and "collaboration" often bridge different thematic areas (Anglada-Tort & Sanfilippo, 2019). Author network analyses indicate that research on musical creativity is sustained by collaborative communities across institutions and disciplines. Interdisciplinary teams linking music conservatories, cognitive neuroscience labs, and educational research centers are particularly influential in shaping theoretical and methodological advances.

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Geographical analyses reveal persistent inequalities in the global production of research on musical creativity. The United States, United Kingdom, Germany, and other Western European countries dominate publication output and citation impact, benefiting from strong institutional infrastructures and funding opportunities (Vicente-Nicolás et al., 2024). Nevertheless, there has been a noticeable increase in contributions from Asia and Latin America since the early 2000s, reflecting broader globalization trends in academic research and improved access to digital publishing platforms. Institutional bibliometric studies show that leading research centers are typically those that combine performance-oriented music programs with cognitive science or psychology departments. Access to advanced facilities such as neuroimaging labs and digital production environments shapes both the volume and thematic focus of research.

Emerging Concepts, Citation Bursts, and Technological Transformations

Bibliometric citation burst analyses reveal rapidly emerging areas that are reshaping the research landscape. Artificial intelligence and machine learning in music creation have experienced the most significant growth since 2015. Mycka and Mańdziuk (2025) identified a rapid expansion of studies on AI-driven composition, human–AI collaborative creativity, and algorithmic recommendation systems. Technologies such as MuseNet and Magenta can now produce complex musical works, raising questions about creative agency, authenticity, and the evolving role of human musicians (Civit et al., 2022). Digitalization more broadly has transformed music creation and research methods. Affordable digital audio workstations, virtual instruments, and cloud-based collaboration platforms have expanded access to creative production, enabling individuals without formal training to produce professional-quality music. This democratization has led researchers to examine how technological mediation influences aesthetic outcomes, learning trajectories, and professional identities.

The COVID-19 pandemic accelerated the adoption of virtual collaboration tools, leading to a rapid increase in studies on online improvisation and remote ensemble performance (Humphries et al., 2023; Liu et al., 2023). These studies have documented both the benefits of maintaining creative communities during periods of isolation and the challenges related to latency, technology access, and embodied interaction. Other emerging research areas include the study of musical creativity across the lifespan and among neurodiverse populations. Despite substantial progress, several gaps remain in the literature on musical creativity. First, research remains geographically and culturally concentrated. Most studies focus on Western traditions, with limited cross-cultural comparative work. Expanding research to diverse cultural settings is necessary to build inclusive theories. Second, methodological issues continue to pose challenges. Measuring and operationalizing musical creativity remains contested. Self-report measures, expert evaluations, and laboratory tasks each have limitations that affect validity and generalizability. Third, technological innovation has outpaced critical examination. While AI and digital tools have rapidly transformed creative practices, their cognitive, educational, and social implications are not fully understood. Moreover, based on the above literature following questions have been constructed.

1. How have annual scientific production and citation trends in musical creativity evolved over time, and what factors have contributed to major surges or fluctuations in research activity and impact since 1939?

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2. What are the central intellectual structures, thematic clusters, and interdisciplinary connections within the musical creativity research domain, as revealed by source analysis, keyword trends, author networks, and topic mapping?
3. How do global patterns of country-level scientific production, institutional affiliations, and international collaborations shape the development and dissemination of musical creativity research?
4. Which keywords, concepts, and clusters have experienced significant citation bursts or emerged as cutting-edge, and how do new technologies (such as artificial intelligence and digitalization) influence the direction and future potential of musical creativity scholarship?

METHODS

Data Collection

This bibliometric analysis was conducted using the Web of Science Core Collection database, which is widely recognized for its comprehensive coverage of peer-reviewed academic literature. The search was performed using the following keywords: "musical creativity," "creative music," "music composition creativity", and "music improvisation creativity." The time frame for this search spanned from January 1, 1939, to December 31, 2025. Records were limited to English-language, peer-reviewed journal articles and reviews. Exclusion criteria included proceedings papers, editorials, book chapters, news items, and non-academic sources. This initial strategy ensured a robust and relevant dataset focused on scholarly research in musical creativity.

Data Cleaning and Preparation

Following extraction, the dataset was imported into Microsoft Excel for a preliminary cleaning phase. Duplicate records were detected using identical DOI, title, and author combinations and subsequently removed. Further, incomplete entries without essential metadata (e.g., missing author or title) were excluded. Articles that, upon closer inspection of abstracts and keywords, did not address musical creativity as a central focus were also removed. Key metadata fields, including authors, institutional affiliations, publication year, keywords, abstract, country, and citation count, were standardized for formatting consistency (such as unifying variant institution or country names). Missing data were manually cross-checked with journal websites or external databases wherever possible.

Before refining the dataset by document type and language, the initial search retrieved a total of 1,922 records from the Web of Science Core Collection for the topic of musical creativity. This broad search encompassed diverse document types and multiple languages, indicating a substantial body of research on the subject. Subsequently, by narrowing the results to include only articles and limiting the language to English, the dataset was further refined to 1,205 records. This step reflects a more focused and rigorous approach, ensuring the inclusion of peer-reviewed research articles in English and enhancing the precision and reliability of subsequent bibliometric analysis. The reduction in document count through these refinements demonstrates the importance of targeted filtering in bibliometric studies to achieve greater specificity and relevance while maintaining robust coverage of the field.

Bibliometric Tools and Software

The final cleaned dataset was imported into bibliometric analysis tools: CiteSpace (version 6.2.1) and the Bibliometrix R-package (version 4.2.1) through RStudio. CiteSpace was used to generate co-citation networks, keyword bursts, and author collaboration maps, offering insights into intellectual structures and emerging clusters. Bibliometrix facilitated

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descriptive statistics, annual trends, country/institutional productivity mapping, three-field plots, and keyword co-occurrence analyses. Both tools produce standard visualizations and allow for reproducible workflows.

Analytical Procedures

Annual productivity was calculated as the number of articles published per year within the defined time frame. Citation trends were measured using total annual citations and average citations per publication. Intellectual structures were mapped by constructing co-citation and bibliographic coupling networks (using thresholds such as minimum five citations per node for inclusion), author networks (minimum five publications per author), and keyword co-occurrence maps. Collaboration indices (e.g., average authors per paper, country collaboration index) and thematic clusters were identified by analyzing author-affiliation and country data. Keyword burst analysis in CiteSpace revealed periods of rapid growth for particular concepts, which were subsequently mapped to cluster timelines.

Visualization and Interpretation

Visualizations, including temporal trend plots, network maps, cluster dendrograms, and thematic evolution graphs, were generated in CiteSpace and Bibliometrix. These visual outputs were interpreted by cross-referencing clusters with abstracts and keyword contexts to ensure thematic accuracy. The interpretation focused on addressing the study's four research questions: (1) publication and citation trends, (2) intellectual clusters, (3) global/collaborative networks, and (4) emerging concepts and technologies. Networks and clusters were described both quantitatively (e.g., frequency, centrality indices) and qualitatively (thematic content and evolution).

Limitations and Rigor

Potential limitations include the restriction to one major database (Web of Science), which may omit relevant scholarship indexed elsewhere; the inclusion of only English-language articles, possibly underrepresenting global research; and the dependence on accurate author and institution metadata. To enhance rigor, data cleaning was performed in multiple passes, ambiguous records were manually verified, and all steps were documented to ensure reproducibility. The use of two independent bibliometric tools enabled cross-verification of findings and supported transparent reporting of all analytical procedures.

Results

The bibliometric analysis of musical creativity research, covering the expansive period from 1939 to 2025, reveals both a rich historical foundation and ongoing, dynamic growth within the field. Over these 86 years, 1,204 scholarly documents were identified across 544 distinct sources. The annual publication growth rate of 5.48% underscores an increasing scholarly interest in musical creativity, while the average document age of 7.5 years and an average of 10.44 citations per document point to both the enduring relevance and growing impact of research outputs. Notably, these documents collectively reference 45,287 works, reflecting deep scholarly engagement and a high degree of interconnectedness within the literature. Keyword analysis yielded 1,152 instances of "Keywords Plus" and 3,555 authors' keywords, highlighting the thematic diversity and multidisciplinary nature of the field. Authorship patterns indicate contributions from 2,358 scholars, with 536 single-authored documents and 570 single-authored papers overall, while the average of 2.29 co-authors per article signals substantial collaboration. International collaboration is notable, with 14.7% of papers featuring authors from more than one country. Together, these metrics chart both the development and present-day

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contours of the scholarly landscape for musical creativity, illustrating robust academic activity, diverse participation, and a solid citation profile.

The annual scientific production graph for musical creativity reveals a remarkable growth trajectory, particularly in the last two decades (See Figure 1). While publication output remained minimal from 1939 through the late 1990s, the field experienced a gradual increase starting around 2000, followed by a steep surge in article production after 2010. The number of published articles peaked dramatically in the early 2020s, reaching its highest point at well over 150 articles annually before showing a slight decrease. This pattern indicates a burgeoning and expanding interest in musical creativity research, with heightened scholarly activity and engagement marking recent years, likely driven by advances in interdisciplinary approaches, technology, and global collaboration in the field.

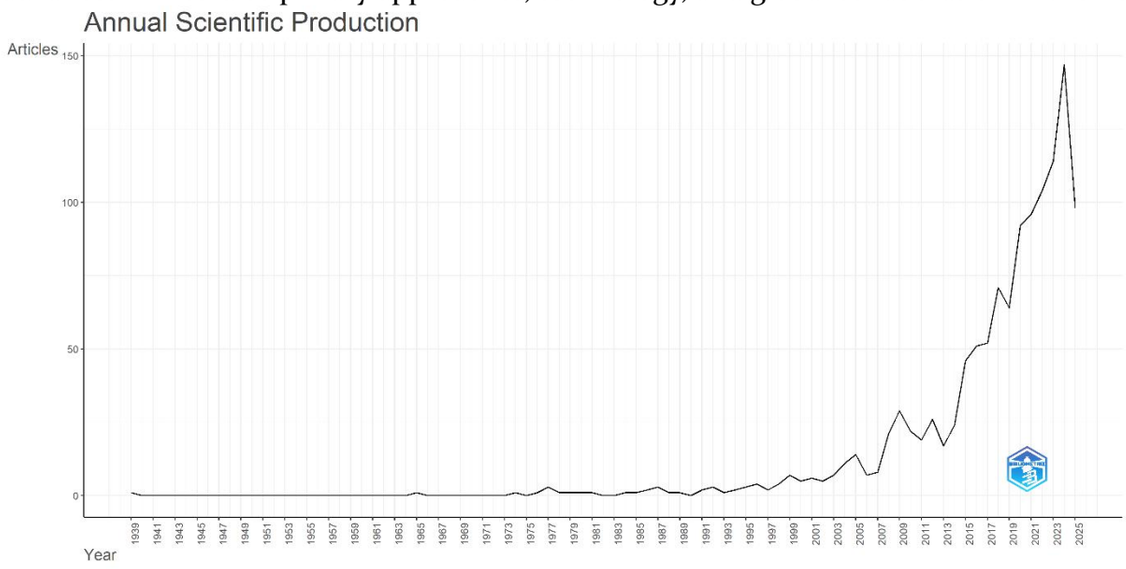

Figure. 1. Annual Scientific Production

The trend in average citations per year for publications on musical creativity demonstrates significant fluctuations, particularly from the late 1990s onward (see figure 2). While citation frequency remained nearly negligible for much of the earlier period, there is a marked increase and volatility beginning around 1995. Notably, a sharp peak in average yearly citations is observed in the early 2000s, reflecting the influence and impact of highly cited works published during that time. Following this spike, although the citation rate experiences variations, it continues at a relatively elevated level compared to the earlier decades, underscoring both the maturation of the field and its growing scholarly influence. More recent years show a gradual decline, possibly due to the influx of newer articles that have yet to accumulate substantial citations, as well as broadening publication volume dispersing citation counts.

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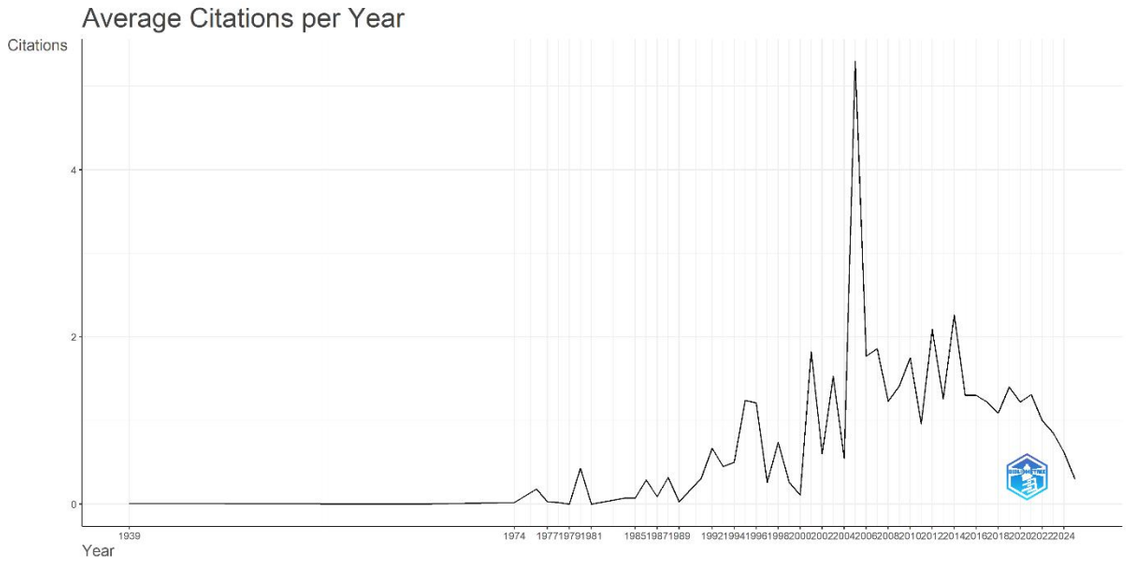

Figure 2. Average Citations per Year for Musical Creativity Publications (1939–2025)

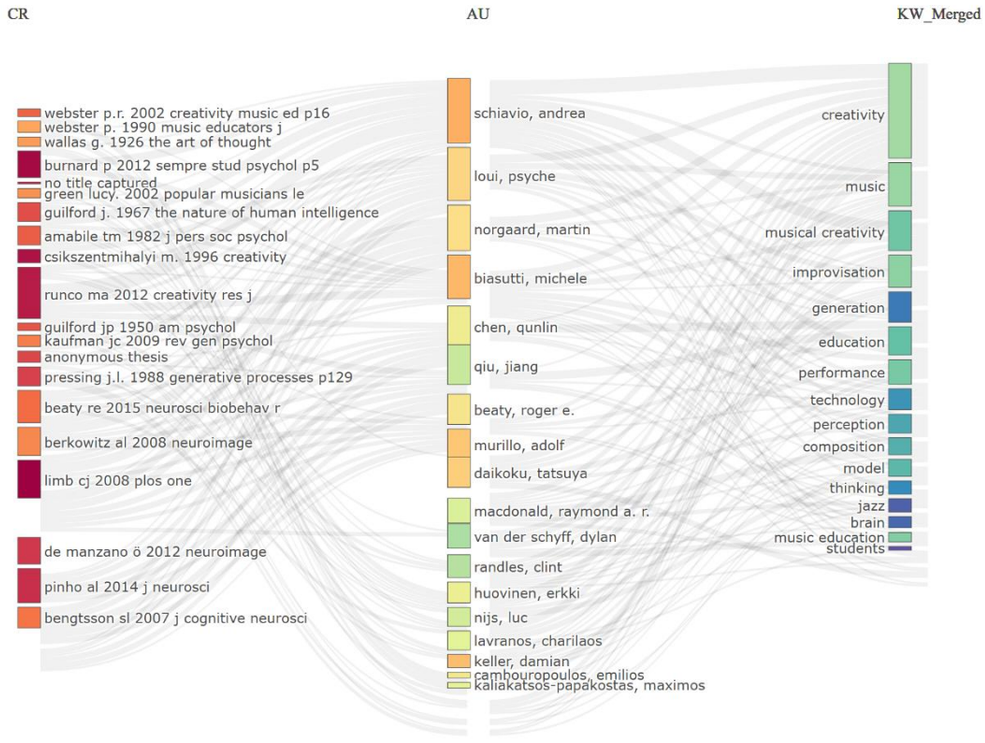

Figure 3. Three-Field Plot

Figure 3 visualization provides an integrated overview of the intellectual landscape within the musical creativity research domain, mapping the relationships across three critical dimensions: Cited References (CR) on the left, Authors (AU) in the center, and Merged Keywords (KW_Merged) on the right. The thickness of the connecting bands illustrates the strength or frequency of the relationship between these entities, while the width of each bar signifies their prominence within the field. The network structure highlights that

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foundational creativity theories—most notably those by Runco, Csikszentmihalyi, Amabile, and Guilford—serve as anchor points, influencing a wide array of research trajectories. Notable clusters also emerge around music education (e.g., Webster, Burnard) and neuroscience-oriented studies (e.g., Limb, Beaty, Berkowitz), reflecting the field's dual emphasis on psychological/pedagogical and neurobiological perspectives.

A critical examination of the plot reveals that certain authors form intellectual bridges by integrating classic theories of creativity with more specialized topics such as musical improvisation, neuroscience, and music education. Keywords like "creativity," "music," "musical creativity," and "improvisation" dominate the thematic structure, while others such as "education," "brain," "technology," and "jazz" highlight specific research foci. The visualization underscores the interdisciplinary and theory-driven—but empirically diverse—nature of the field, as well as the emergence of neuroscience as a frontier in creativity studies. By following the strongest connections and flows within this plot, researchers can identify central contributors, research fronts, and areas ripe for further exploration or cross-disciplinary collaboration.

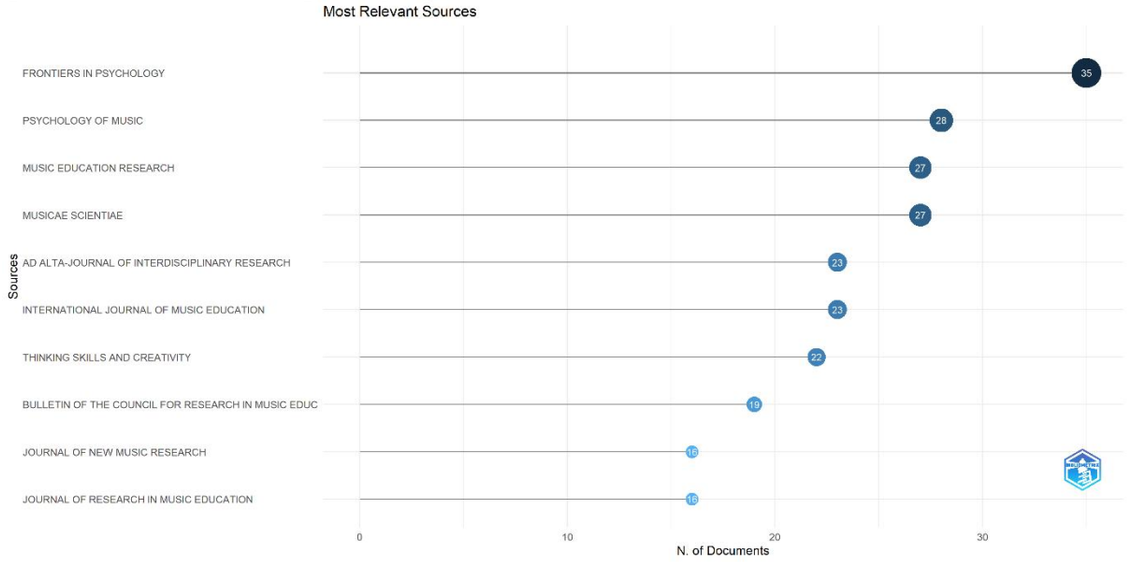

Figure 4. Most Relevant Sources for Musical Creativity Research

Figure 4 highlights the sources that have contributed most significantly to the scholarly conversation on musical creativity. "Frontiers in Psychology" stands out as the leading journal, with 35 documents represented in the dataset, reflecting its prominence and broad reach within the field. Closely following are "Psychology of Music," "Music Education Research," and "Musicae Scientiae," each with 27–28 articles, emphasizing the centrality of educational and psychological themes in contemporary research. Other journals such as "Ad Alta-Journal of Interdisciplinary Research," "International Journal of Music Education," and "Thinking Skills and Creativity" also make notable contributions, each hosting over 20 relevant publications. The visualization in Figure 4 demonstrates the multidimensional and interdisciplinary nature of musical creativity research, with key journals spanning the domains of psychology, education, creativity studies, and musicology.

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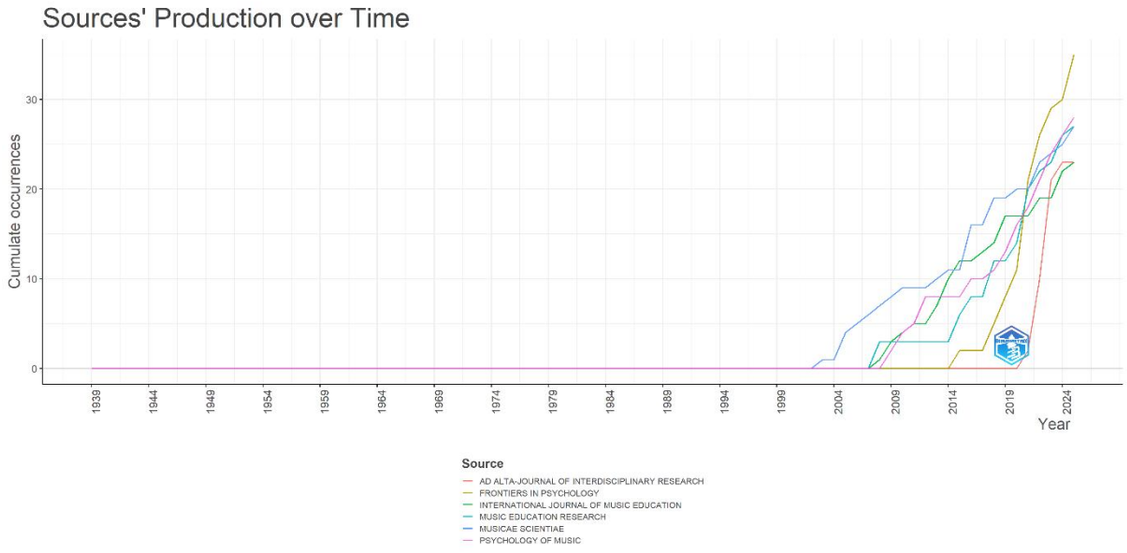

Figure 5. Sources' Production Over Time

Figure 5 tracks the cumulative number of publications from leading journals in the field of musical creativity across the span of the study period. The graph illustrates that significant scholarly activity from major sources—such as "Frontiers in Psychology," "Music Education Research," "Musicae Scientiae," "Psychology of Music," and "International Journal of Music Education"—began to rise sharply only after the early 2000s. Since then, these journals have increasingly contributed to the literature, with marked growth visible from roughly 2015 onwards. "Frontiers in Psychology" and "Ad Alta-Journal of Interdisciplinary Research" show the most pronounced increases in cumulative occurrences in recent years, signaling their growing importance in the dissemination of musical creativity research. Overall, Figure 5 highlights the accelerating pace and diversification of research publication in this domain, offering clear evidence of the expanding significance of dedicated sources over the past two decades.

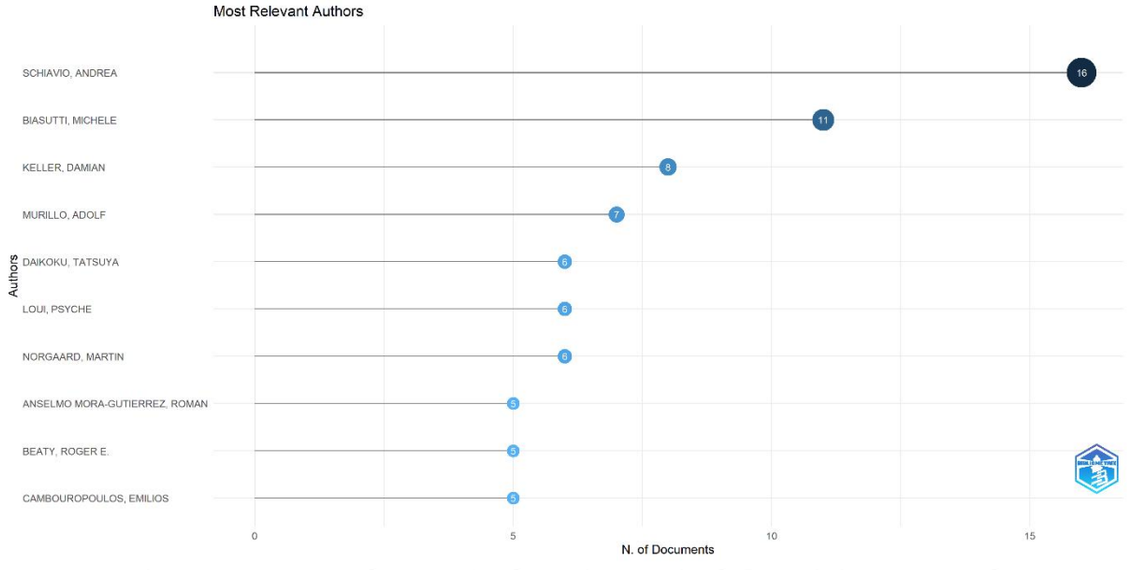

Figure 6. Most Relevant Authors in Musical Creativity Research

Figure 6 depicts the most influential authors within the field, ranked by the number of documents contributed to musical creativity scholarship. Andrea Schiavio leads with 16

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publications, followed by Michele Biasutti with 11, indicating their prominent roles in shaping research directions and discourse. Damian Keller, Adolf Murillo, and Tatsuya Daikoku also show substantial output, each delivering between 7 and 8 articles. Other notable contributors include Psyche Loui, Martin Norgaard, Anselmo Mora-Gutierrez, Roger E. Beaty, and Emilios Cambouropoulos, each with 5–6 publications. The visualization in Figure 6 highlights the key individuals responsible for a significant proportion of research innovation and scholarly output, offering a valuable guide for identifying leading experts and potential collaborators in musical creativity studies.

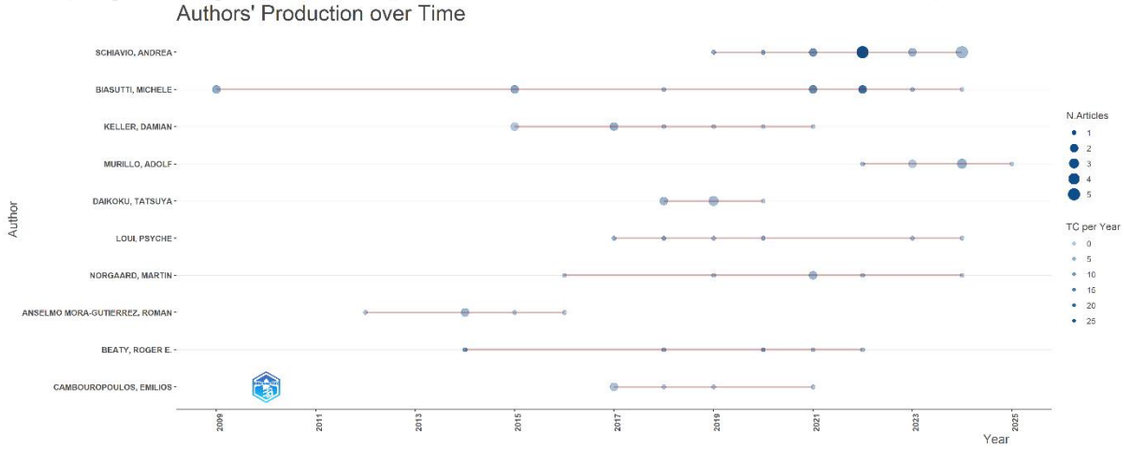

Figure 7. Authors' Production Over Time

Figure 7 illustrates the temporal distribution and citation impact of the most prolific and influential authors in musical creativity research. The data reveals a blend of publication strategies, from short, high-intensity bursts of impactful work to sustained contributions over longer periods. Notably, the years 2020–2024 witnessed significant surges in both publication volume and citation impact, driven by authors like Andrea Schiavio and Michele Biasutti, whose research addressed contemporary issues such as remote music education and the effects of the COVID-19 pandemic. Others, including Damian Keller and Adolf Murillo, exhibit long-term engagement with themes of music creativity and pedagogy. Simultaneously, several authors—such as Daikoku, Loui, and Norgaard—established distinct peaks in productivity and impact, particularly in neuroscience and improvisation studies.

This figure underscores the dynamic nature of the field, where new challenges and interdisciplinary questions catalyze both established and emerging thought leaders. The most recent years are characterized by intensified collaboration and high-impact works, suggesting a rapidly evolving research landscape. Authors such as Roger E. Beaty and Emilios Cambouropoulos contribute consistent, high-quality publications that garner sustained citations, illuminating key advances in the neuroscience and computational aspects of musical creativity. The granular analysis of each author's temporal trajectory not only highlights individual achievements but also signals broader trends influencing the discipline, including responses to global events and the continual integration of new theoretical and technological insights.

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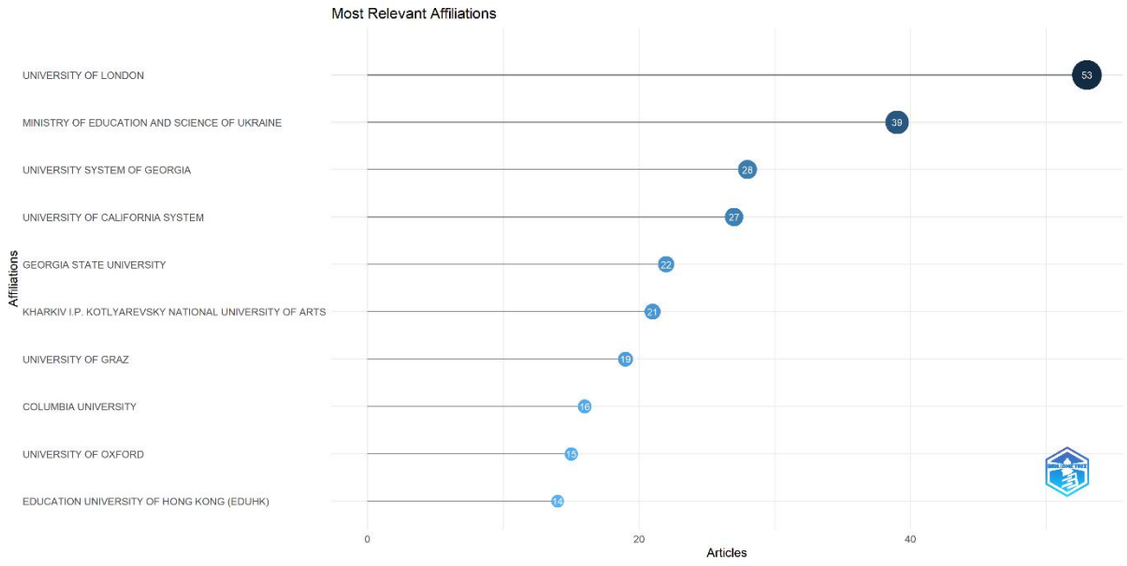

Figure 8. Most Relevant Affiliations in Musical Creativity Research

Figure 8 reveals the institutional landscape of musical creativity research, highlighting the global distribution of scholarly contributions across prominent universities and research centers. The University of London leads with 53 publications, establishing itself as the most productive institution in this field. Following closely are the Ministry of Education and Science of Ukraine with 30 publications and the University System of Georgia with 26 publications, indicating strong regional research clusters. Notable international representation includes the University of California System (22 publications), Georgia State University (22 publications), and Kharkiv I.P. Kotlyarevsky National University of Arts (21 publications). European institutions such as the University of Graz (19 publications) and the University of Oxford (15 publications) also demonstrate significant engagement, while institutions like Columbia University, and Education University of Hong Kong contribute meaningfully to the discourse. This distribution in Figure 8 underscores the truly international and interdisciplinary nature of musical creativity research, with contributions spanning multiple continents and educational systems.

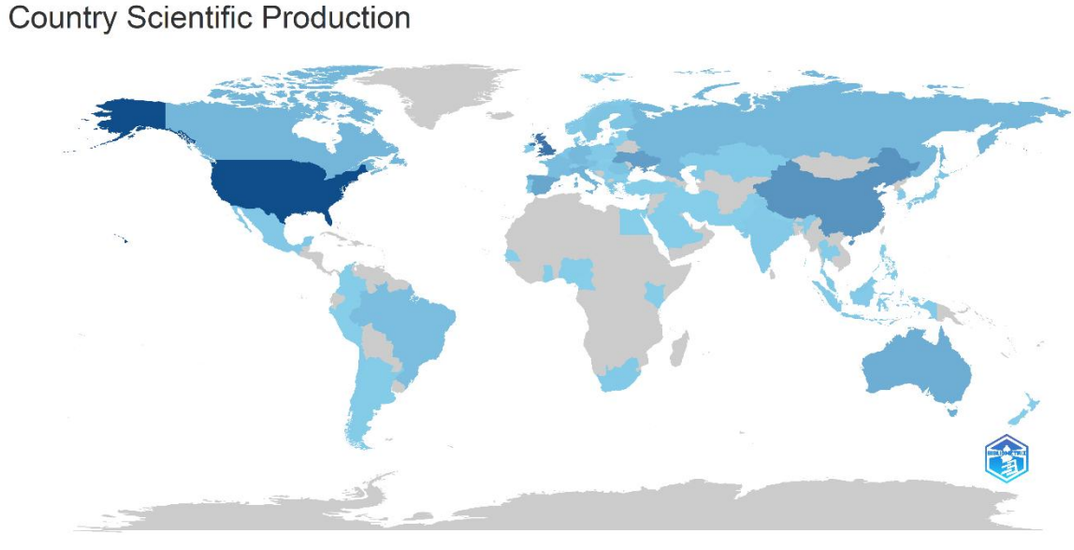

Figure 9. Country Scientific Production in Musical Creativity Research

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A global analysis of scientific production in the field of musical creativity, as illustrated in Figure 9, highlights the United States as the dominant contributor with 385 publications. The United Kingdom follows with 267 publications, reflecting a strong European presence, while China (171), Ukraine (137), and Spain (110) further emphasize the field's international reach. Australia (92), Italy (78), Canada (66), Russia (63), and Germany (60) round out the top ten contributing countries. This distribution demonstrates the prominent roles of North America, Western Europe, and East Asia, but also underscores emerging engagement from Eastern Europe and other regions. The map visualization underscores how the advancement of musical creativity research is a collaborative international endeavor, shaped by diverse academic and cultural contexts across the globe.

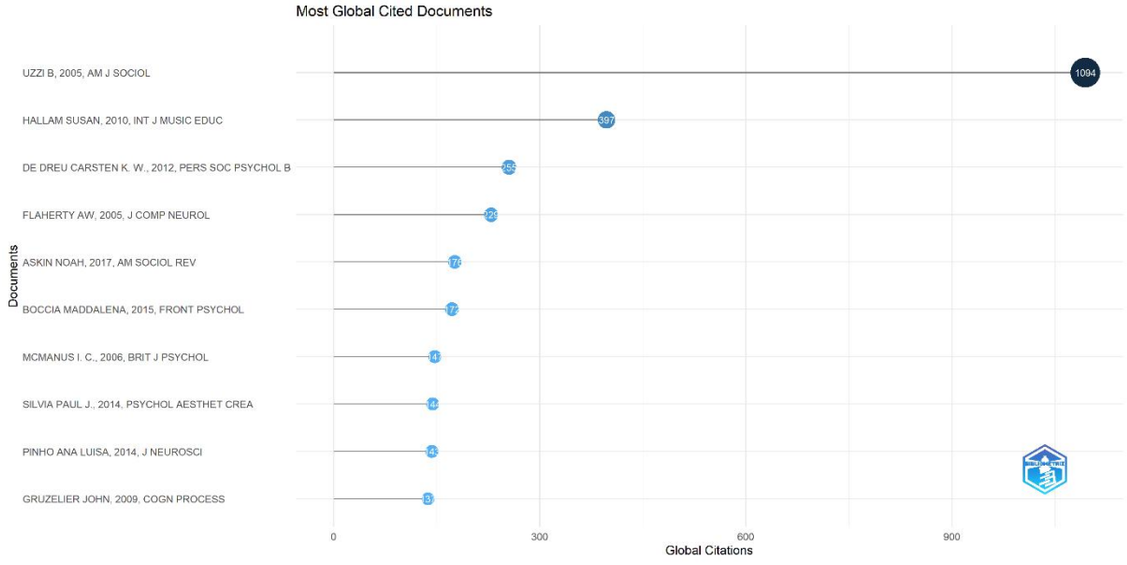

Figure 10. Most Globally Cited Documents in Musical Creativity Research

Figure 10 showcases the documents that have received the highest number of global citations within the corpus of musical creativity research. Leading the citation rankings is Uzzi B.'s 2005 American Journal of Sociology paper, amassing 1,094 citations, followed by Hallam Susan's influential 2010 study in the International Journal of Music Education with 397 citations. Other top-cited works include De Dreu Carsten K. W. (2012, 258 citations), Flaherty A. W. (2005, 232 citations), and Askin Noah (2017, 171 citations), reflecting the interdisciplinary reach and foundational impact of these studies. Additional highly cited documents span diverse topics from neuropsychology to creativity studies, indicating their broad recognition and enduring influence across multiple domains. Figure 10 reveals the critical works that have shaped discourse, guided research trajectories, and served as central reference points in the development of musical creativity scholarship.

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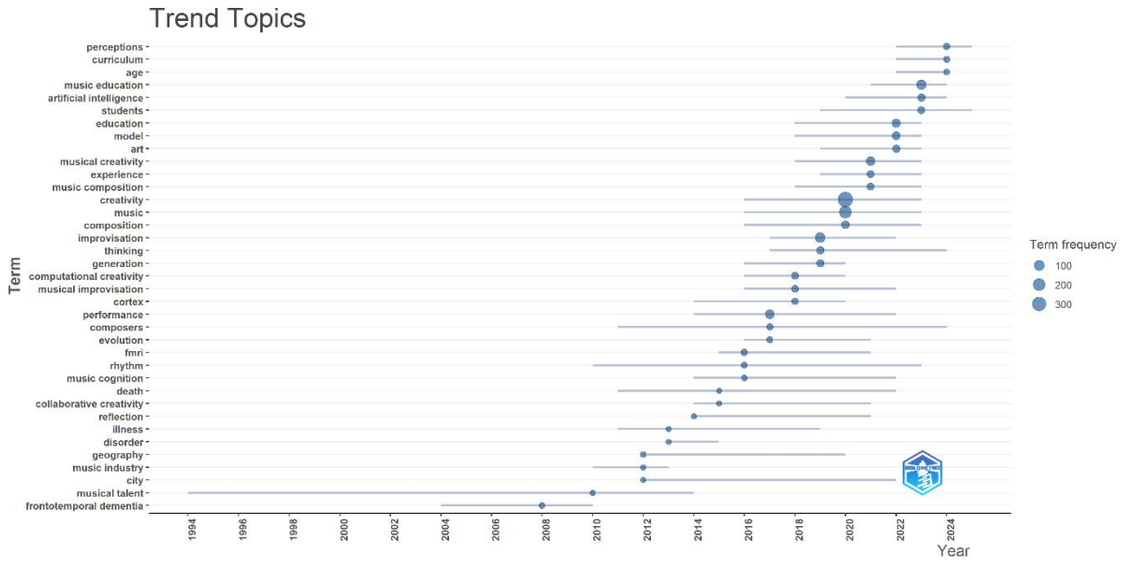

Figure 11. Trend Topics in Musical Creativity Research

Figure 11 presents a comprehensive timeline of the most prominent topics in the field, reflecting both the evolution and diversification of research focus areas over the past three decades. The visualization shows that while early studies before 2010 were relatively sparse and centered around niche or foundational themes such as "musical talent" and "frontotemporal dementia," there was a sharp uptick in both the frequency and range of keywords after 2010. Core terms like "music," "creativity," "musical creativity," "composition," and "improvisation" emerge with increasing prominence and frequency from the mid-2010s onward, alongside enduring interest in cognitive and neuroscientific aspects as indicated by keywords like "music cognition," "fmri," "cortex," and "perceptions." Notably, educational and pedagogical terms ("music education," "curriculum," "students") consistently show up, underscoring continuous scholarly attention to music learning environments and teaching practices.

The most striking recent development is the rapid and substantial rise of topics related to technology, especially "artificial intelligence" and "computational creativity," which have moved to the forefront of the discipline in the last five years. The large bubble sizes for these keywords from 2020 to 2024 highlight their emergence as dominant research frontiers, reflecting a growing interdisciplinary convergence between music, creativity studies, neuroscience, and computer science. This shift illustrates how the field has moved towards technologically driven paradigms and neuro-cognitive investigations, with topics like AI-driven music creation, cognitive models of creativity, and the neuroscience of musical performance now at the vanguard of inquiry. The evolving trend topics underscore not only the maturation of certain traditional themes but also the dynamic incorporation of innovative methodologies and emerging scientific interests within the musical creativity research landscape.

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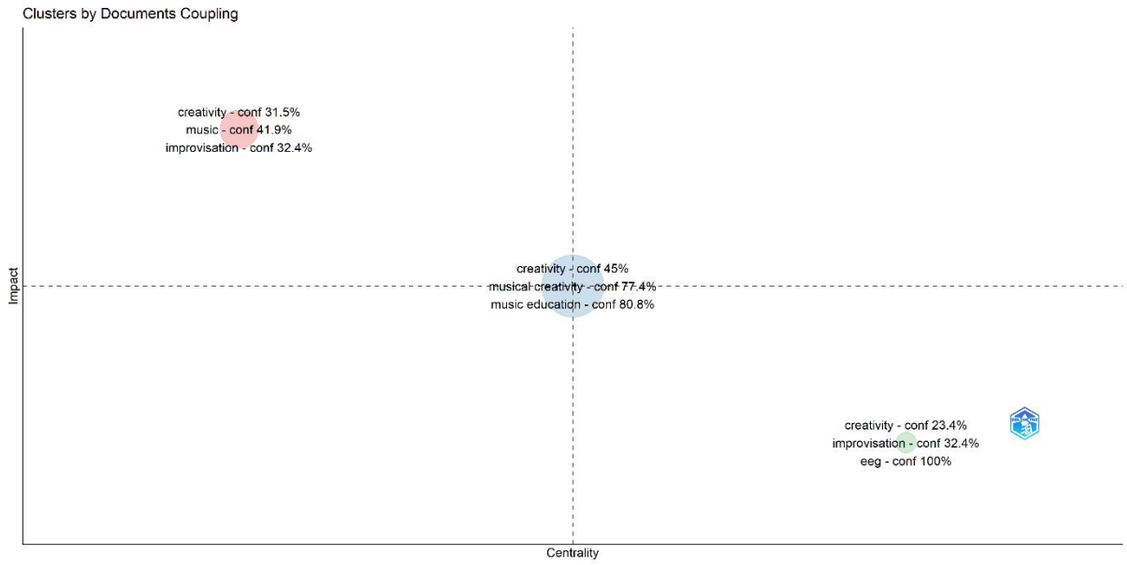

Figure 12. Clusters by Documents Coupling: Impact and Centrality

Figure 12 visualizes the main research clusters within musical creativity studies, based on document coupling, and positions them according to their relative impact (y-axis) and centrality (x-axis). Three primary groupings are discerned: (1) The upper left quadrant (higher impact, lower centrality) features clusters centered on "creativity," "music," and "improvisation," indicating foundational themes with widespread academic influence but limited direct connectivity to the broader network. (2) The central region contains the most integrated and central clusters—namely "creativity" (45%), "musical creativity" (77.4%), and "music education" (80.8%). These topics serve as key bridges, connecting multiple subfields and sustaining the intellectual core of scholarly discourse. (3) The lower right quadrant (higher centrality, lower impact) highlights clusters such as "creativity," "improvisation," and "eeg," with "eeg" (100%) representing highly specialized, method-oriented work embedded within the network's technical core. This mapping underscores the dual structure of the field, with certain traditional concepts carrying broad academic impact, while methodological and pedagogical themes act as central connectors, driving interdisciplinary integration and networked research across musical creativity scholarship.

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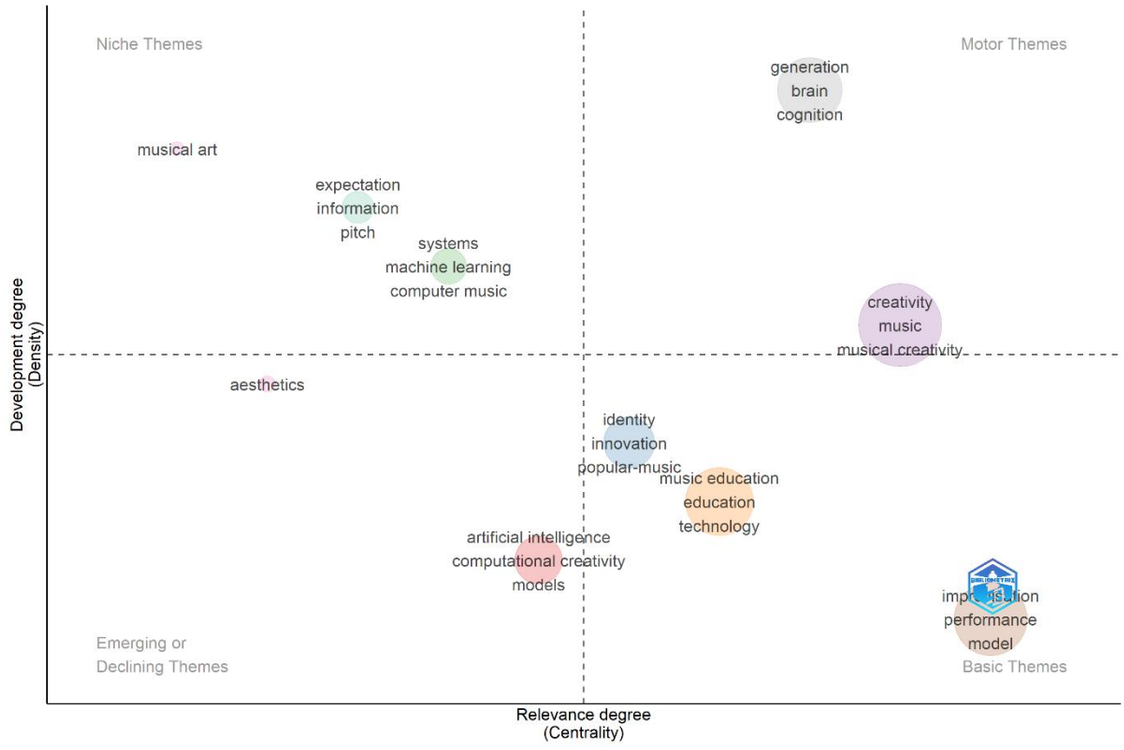

Figure 13. Thematic Map of Musical Creativity Research

Figure 13 visually organizes the major themes in musical creativity research across two axes: development degree (density) and relevance degree (centrality). "Creativity," "music," and "musical creativity" appear as the most central and well-developed motor themes, signifying their foundational status and strong integration in the scholarly network. In the lower right quadrant, "improvisation," "performance," and "model" represent basic themes, strongly connected to others but still developing in density—these form the conceptual backbone of practical and theoretical discussions. Motor themes such as "generation," "brain," and "cognition," positioned in the upper right, highlight cutting-edge, highly developed domains that increasingly drive the intellectual frontier.

The upper left quadrant reveals niche themes—such as "musical art," "expectation," "pitch," "information," and various technology-driven subfields (e.g., "machine learning," "computer music")—with specialized development but limited central integration. Meanwhile, emerging or declining themes like "aesthetics," "artificial intelligence," and "computational creativity" cluster in the lower left, suggesting areas with either burgeoning relevance or waning historical prominence. Notably, terms like "identity," "innovation," "music education," and "technology" populate the transitional space around the center, reflecting their current evolution from supporting roles toward greater centrality and influence in the evolving landscape of musical creativity scholarship.

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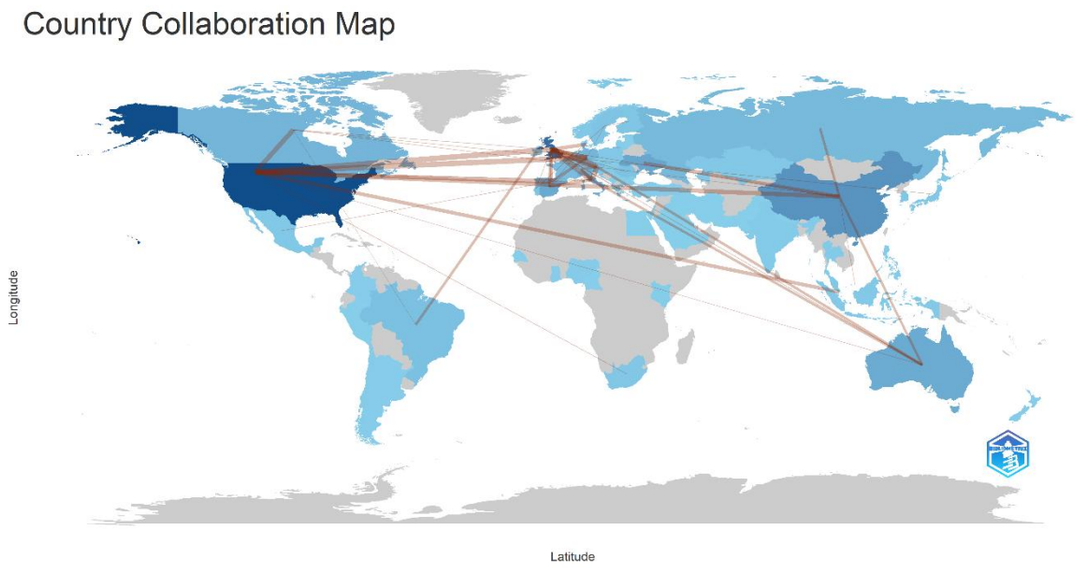

Figure 14. Country Collaboration Map

Figure 14 demonstrates that musical creativity research is not only globally distributed but also intensely collaborative, with the United States acting as the central nexus for international partnerships. The USA maintains robust, high-volume collaborations with major scientific producers in the UK, Germany, China, Australia, and Canada, forming dense transatlantic and transpacific networks. European countries are highly interconnected both amongst themselves and with other leading nations, while China is rapidly emerging as a global hub with expanding partnerships, especially with the USA and major European powers. Although the strongest collaborative ties concentrate around North America, Europe, and key parts of East Asia and Oceania, the map also highlights regional disparities, with thinner collaboration lines and lighter production intensities in South America, Africa, and parts of Eastern Europe. Overall, this pattern underscores the prominence of leading scientific nations not only as major producers but also as highly interconnected magnets for international research efforts in the field.

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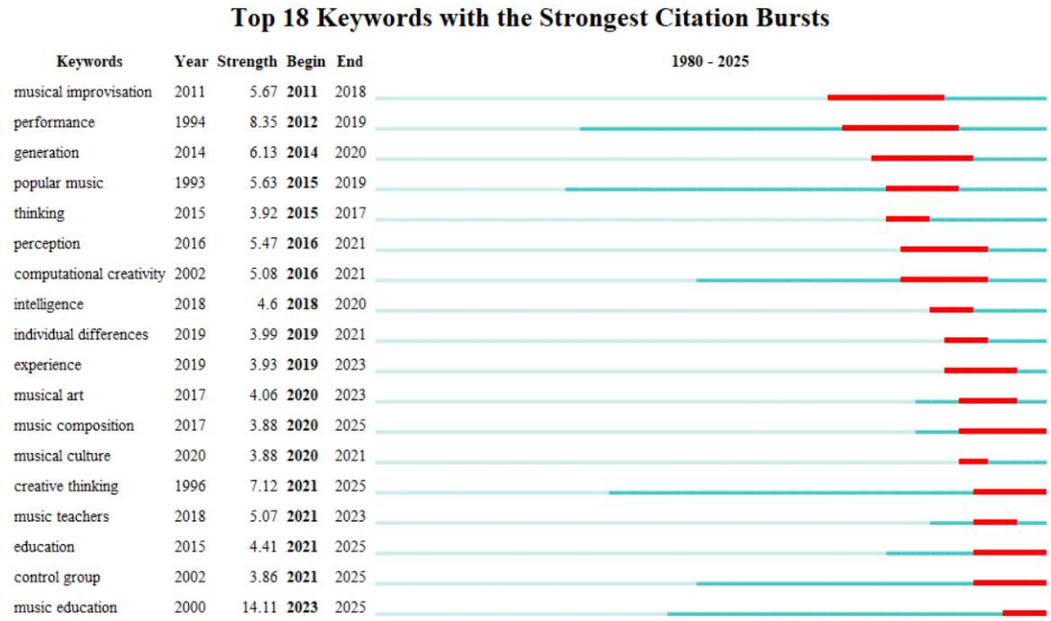

Figure 15. Top 18 Keywords with the Strongest Citation Bursts

Figure 15 highlights the top 18 keywords that have experienced the most significant citation bursts in the literature on musical creativity from 1980 to 2025. These keywords reflect pivotal shifts and emerging hot topics in the field over time, as shown by the strength and duration of their citation bursts. Earlier bursts focused on foundational themes such as "performance," "popular music," and "creative thinking," while more recent bursts (especially those continuing into 2023–2025) are associated with cutting-edge and educational topics like "computational creativity," "musical art," "music teachers," "music composition," and—most strikingly—"music education," which shows the strongest and most recent citation burst. The persistence and concentration of these bursts, indicated by compressed red bars toward the right, underline how the field's intellectual focus has shifted over time—moving from traditional categories toward contemporary issues involving creativity, education, and technological innovation in music research.

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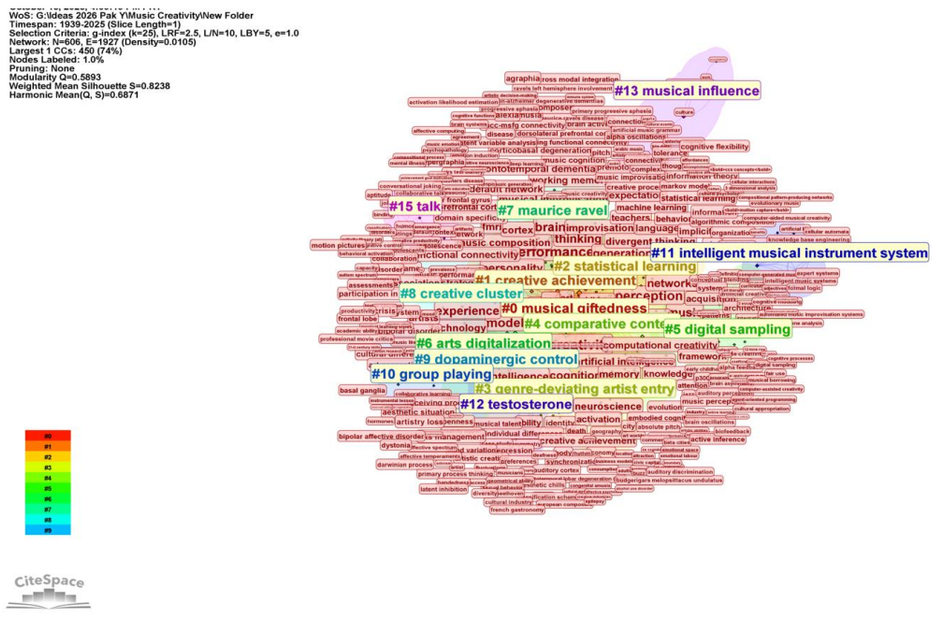

Figure 16. Network Visualization of Research Clusters in Musical Creativity

Figure 16 presents a CiteSpace-generated network map that visualizes the clustering of research topics within the musical creativity literature. Each colored node represents a distinct concept or keyword, while cluster labels (such as "#0 musical giftedness", "#6 arts digitalization", "#7 maurice ravel", "#10 group playing", "#11 intelligent musical instrument system", and "#13 musical influence") highlight major thematic groupings derived from co-citation and co-occurrence analysis. The density and interconnectivity of nodes underscore the high complexity and overlap among research areas in the field. Larger, central clusters denote foundational or highly integrated topics such as "musical giftedness," "arts digitalization," and "group playing," while more peripheral or topically specialized clusters (e.g., "#12 testosterone," "#8 creative cluster") suggest emerging subfields or unique interdisciplinary intersections. The inclusion of clusters such as "intelligent musical instrument system" and "digital sampling" signals the growing integration of technology with traditional studies of creativity and music, confirming ongoing advances and diversification in the scholarly landscape.

DISCUSSION

The bibliometric examination of musical creativity scholarship reveals a field that has evolved from fragmented disciplinary silos into a mature interdisciplinary domain characterized by exponential growth, methodological sophistication, and increasing global collaboration. This transformation reflects not only the inherent complexity of creative phenomena in music but also broader shifts in educational policy, technological capability, and scientific infrastructure that have collectively elevated musical creativity from a peripheral concern to a central research priority across multiple disciplines. The findings demonstrate how the field has matured through successive phases of theoretical development, empirical refinement, and paradigmatic innovation, while simultaneously highlighting persistent imbalances and emerging frontiers that will shape future scholarship.

Temporal Evolution and Citation Dynamics

The temporal analysis reveals a field characterized by prolonged dormancy followed by accelerating expansion, with particularly dramatic growth occurring since 2010. This

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pattern diverges markedly from the steady linear progression observed in many established disciplines, instead reflecting the influence of specific catalytic events and enabling conditions that periodically transformed the field's scale and scope. The early period of minimal publication activity through the late twentieth century reflects the dominance of behaviorist paradigms in psychology and technical proficiency-oriented approaches in music education, neither of which prioritized creativity as a central construct worthy of systematic investigation (Webster, 2002). During this era, creativity remained conceptually vague and methodologically intractable, relegated to the margins of both psychological and musicological inquiry.

The period of rapid expansion beginning around 2000 reflects multiple converging influences. Educational policy reforms emphasizing twenty-first-century competencies, particularly within European contexts, elevated creativity to a core educational objective, thereby stimulating research examining how creative capacities could be systematically cultivated (De-Marchis & Shchebetenko, 2022; Hernández-Torrano & Ibrayeva, 2020). Simultaneously, advances in neuroimaging technology enabled unprecedented access to the neural substrates of creative musical performance, catalyzing a surge of neuroscientific investigations that attracted substantial citations and elevated the field's visibility (Limb & Braun, 2008). The landmark study by Limb and Braun (2008) demonstrating dissociated activation patterns during jazz improvisation became one of the most highly cited works in the corpus, exemplifying how methodological innovation could fundamentally reshape research possibilities and attract interdisciplinary attention.

The exponential growth after 2010 coincides with the proliferation of accessible digital production tools and platforms that democratized music creation, expanding both the population of practitioners and the range of creative practices amenable to study (Mycka & Mańdziuk, 2025). The integration of artificial intelligence and computational methods introduced entirely new research paradigms, enabling investigations of algorithmic creativity and human-machine creative collaboration that were previously inconceivable (Civit et al., 2022; Mycka & Mańdziuk, 2025). These technological transformations not only provided novel research tools but also fundamentally altered the phenomenon under investigation, as digital mediation became increasingly central to contemporary creative practice.

The citation pattern reveals that scholarly impact peaked during the early 2000s, when foundational theoretical frameworks and seminal empirical studies established core paradigms that shaped subsequent inquiry. The subsequent citation volatility reflects both the dramatic expansion in publication volume, which dispersed citation attention across a larger corpus, and the temporal lag inherent in scholarly communication systems, whereby recent publications have not yet accumulated citations commensurate with their eventual influence (Ozenc-Ira, 2023). Nevertheless, the sustained elevation of average citations relative to pre-2000 levels indicates that the field continues producing high-impact scholarship that fundamentally shapes subsequent research trajectories.

The COVID-19 pandemic introduced a significant perturbation, initially disrupting established research and practice patterns before catalyzing rapid adaptation and innovation. Researchers swiftly pivoted to examining virtual collaboration, online music education, and music's role in supporting wellbeing during social isolation, demonstrating the field's capacity for responsive reconfiguration in the face of external shocks (Chmiel et al., 2022). This adaptability suggests resilience and pragmatic orientation as defining

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characteristics of the musical creativity research community, capable of rapidly redirecting attention toward urgent practical challenges while maintaining theoretical sophistication.

Intellectual Structures and Thematic Organization

The analysis of intellectual structures reveals a field organized around several major thematic clusters that collectively encompass psychological, neurobiological, educational, technological, and sociocultural dimensions of musical creativity. These clusters exhibit varying degrees of internal coherence and external connectivity, reflecting both the maturation of established research streams and the emergence of novel intersections that challenge traditional disciplinary boundaries.

The cognitive and neuroscientific cluster has achieved particular prominence, anchored by foundational theoretical contributions from scholars such as Csikszentmihalyi, Amabile, Guilford, and Runco, whose general creativity theories provided frameworks subsequently adapted to musical contexts. The neurobiological investigations by Limb and Braun (2008) and subsequent researchers have mapped neural networks supporting spontaneous improvisation, revealing dissociated activity patterns wherein self-expressive medial prefrontal regions activate while executive control areas deactivate. These findings fundamentally reshaped understanding of creative cognition, demonstrating that creativity emerges not from heightened cognitive control but from its temporary suspension, allowing associative processes to generate novel combinations. This neuroscientific evidence provided biological validation for psychological theories emphasizing the role of reduced inhibition and enhanced associative thinking in creative expression.

The pedagogical cluster addresses how educational environments can cultivate creative capacities through curricular design, instructional strategies, and assessment practices. Prominent contributors including Webster, Burnard, and others have challenged transmission-oriented pedagogies prioritizing reproduction over invention, advocating instead for student-centered approaches emphasizing improvisation, composition, and collaborative creation (Webster, 2002, 2016). Research in this stream has demonstrated that engagement with improvisatory activities significantly enhances divergent thinking and creative problem-solving compared to didactic instruction. Furthermore, educators' conceptions of creativity substantially influence the learning opportunities they provide, with those holding process-oriented views more likely to foster exploratory, risk-tolerant classroom cultures (Kokotsaki & Newton, 2015). Assessment practices constitute another critical focus, as traditional evaluation frameworks emphasizing technical accuracy may inadvertently suppress creative risk-taking, necessitating alternative approaches that recognize diverse manifestations of creative achievement.

The collaborative creativity cluster examines how creative output emerges from social interaction rather than isolated individual effort, with Sawyer's (2006) work on distributed cognition in ensemble improvisation providing foundational frameworks. This research stream challenges individualistic accounts locating creativity solely within single minds, instead demonstrating how creative structures emerge through coordinated interaction among participants. Studies have identified communication modalities supporting creative coordination, including gestural cues, eye contact, and anticipatory listening, all of which enable performers to negotiate emergent musical structures in real time.

The technological mediation cluster addresses how digital tools, artificial intelligence, and online platforms are transforming both creative practices and research methodologies.

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Artificial intelligence has progressed from simple algorithmic composition to sophisticated generative systems capable of producing stylistically diverse musical outputs, raising fundamental questions about creative agency, aesthetic judgment, and the role of human intention in determining creative value (Civit et al., 2022; Mycka & Mańdziuk, 2025). While these systems demonstrate impressive technical capabilities, critical questions persist regarding whether computational outputs constitute genuine creativity or merely sophisticated pattern recombination. Digital audio workstations and cloud-based collaboration platforms have democratized music production, enabling individuals without formal training to create professional-quality recordings, thereby expanding the population of music creators while potentially homogenizing aesthetic outcomes as users gravitate toward platform-embedded templates and algorithmic recommendations.

The thematic mapping reveals that certain topics function as motor themes characterized by high centrality and density, including core constructs such as creativity, music, musical creativity, and improvisation. These topics serve as intellectual hubs connecting diverse research streams and sustaining ongoing scholarly discourse. Other themes occupy niche positions with specialized development but limited integration, including specific methodological approaches and cultural contexts. Emerging themes positioned in transitional spaces suggest areas experiencing rapid growth but not yet fully integrated into mainstream discourse, including artificial intelligence, computational creativity, and non-Western musical traditions.

Geographic Distribution and Collaborative Networks

Geographic analysis reveals pronounced concentration of research productivity in North America and Western Europe, with the United States producing the highest volume of publications, followed by the United Kingdom, China, Ukraine, and Spain. This pattern reflects longstanding asymmetries in research infrastructure, funding availability, and academic prestige hierarchies that privilege institutions in economically developed nations. Universities in these regions benefit from well-resourced music programs, access to advanced neuroimaging facilities, and robust funding mechanisms supporting interdisciplinary collaboration.

Nevertheless, the emergence of substantial contributions from China, Ukraine, and other regions signals gradual diversification of the global research landscape. China has experienced particularly rapid growth, driven by government investments in science and technology coupled with expanding higher education enrollment. Similarly, Eastern European institutions, particularly in Ukraine, have made notable contributions, reflecting regional strengths in music education and performance traditions. However, these expanding contributions remain modest relative to Western dominance, and citational influence of work produced in emerging economies tends to lag behind output volume, suggesting persistent barriers to international visibility (Ozenc-Ira, 2023; Vicente-Nicolás & Sánchez-Marroquí, 2024).

International collaboration has intensified substantially, with nearly fifteen percent of publications featuring multi-national authorship. These collaborations predominantly involve partnerships between leading Western institutions and emerging research centers in Asia and Eastern Europe, suggesting hub-and-spoke network structures wherein Western universities serve as central nodes facilitating knowledge exchange (Vicente-Nicolás & Sánchez-Marroquí, 2024). While such collaborations potentially enable resource sharing and capacity building, they may also perpetuate neo-colonial dynamics wherein

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non-Western researchers provide data or context while conceptual frameworks and theoretical interpretations remain Western-centric.

Institutional analysis identifies leading contributors as those integrating performance-oriented music conservatories with cognitive science, psychology, or neuroscience departments, enabling interdisciplinary teams to pursue questions requiring diverse methodological expertise. The University of London, Ministry of Education and Science of Ukraine, and University System of Georgia emerge as particularly productive institutions, reflecting either organizational scale or concentrated programmatic focus on creativity research. Institutions housing neuroimaging facilities demonstrate particular productivity in neuroscientific investigations of creativity, while those with strong connections to professional music industries tend to emphasize technology-mediated creativity and commercial applications.

The collaborative network exhibits small-world properties characterized by dense local clustering combined with short path lengths connecting distant nodes, facilitating rapid information diffusion across the network (Vicente-Nicolás & Sánchez-Marroquí, 2024). These structural properties support innovation by enabling researchers to access diverse perspectives while maintaining coherent interpretive communities. However, the network also displays modular structure with relatively insular subcommunities organized around disciplinary boundaries, potentially limiting cross-fertilization of ideas and perpetuating fragmented understanding.

Emergent Frontiers and Technological Transformation

Citation burst analysis and keyword tracking reveal several rapidly emerging research frontiers reshaping the field's intellectual landscape. Artificial intelligence and computational creativity have experienced the most dramatic growth, reflecting both technological breakthroughs and growing interest in human-machine creative collaboration (Civit et al., 2022; Mycka & Mańdziuk, 2025). Machine learning algorithms can now generate musical compositions exhibiting structural coherence and stylistic consistency, raising fundamental questions about the nature of creativity, authorship, and aesthetic value. Some researchers view these developments as liberating, expanding creative possibilities beyond human cognitive constraints, while others express concern about diminished human agency and aesthetic homogenization.

The sustained citation burst in music education reflects ongoing scholarly attention to pedagogical innovation and curriculum reform, corresponding to broader educational movements emphasizing student-centered learning, authentic assessment, and cultivation of twenty-first-century competencies (De-Marchis & Shchebetenko, 2022; Hernández-Torrano & Ibrayeva, 2020). Specific foci include strategies for fostering improvisation and composition skills, designing creativity-supportive learning environments, and developing assessment frameworks recognizing diverse creative achievements. The integration of technology into music education constitutes another active frontier, as educators navigate tensions between leveraging digital tools' affordances and preserving embodied, communal aspects of musical practice.

The COVID-19 pandemic accelerated the adoption of virtual collaboration tools, leading to rapid increase in studies examining online improvisation and remote ensemble performance (Chmiel et al., 2022). These studies have documented both the benefits of maintaining creative communities during periods of isolation and the challenges related to latency, technology access, and embodied interaction. Research exploring optimal technological configurations, communication strategies, and pedagogical adaptations for

virtual contexts will remain essential as digital mediation becomes increasingly prevalent in musical practice.

Non-Western musical traditions and cross-cultural perspectives remain significantly underrepresented despite their importance for developing inclusive theories of creativity. Most research adopts Western assumptions regarding individualism, novelty, and expressivity as creativity criteria, potentially marginalizing traditions emphasizing collective creation, adherence to established forms, or spiritual dimensions. Expanding cross-cultural research will require collaborative partnerships respecting indigenous knowledge systems and developing culturally grounded methodological approaches.

LIMITATIONS AND FUTURE DIRECTIONS

The study has several limitations. It relies on a single database, which means that relevant research published in non-indexed journals, conference proceedings, or non-English languages may not have been captured. This limitation particularly affects work from the Global South, where local journals often lack indexing. Bibliometric methods are sensitive to database structures, citation practices, and indexing errors. Time-based citation measures can underestimate the impact of recent publications. Network visualizations depend on threshold parameters, which can shape cluster boundaries and affect interpretations. Affiliation data can also contain inconsistencies, especially for authors with multiple institutional ties.

Future research can address these limitations by combining multiple databases, including Scopus and discipline-specific sources, to improve coverage. Incorporating non-English literature and gray sources will provide a more comprehensive view. Temporal community detection methods could help track how thematic clusters evolve over time, offering insight into the dynamics of intellectual change. Integrating bibliometrics with qualitative methods, such as expert coding of article samples, would improve the validity of thematic classifications. Comparative analyses across regions, using shared instruments and co-authored designs, can bring greater diversity and contextual richness to the field. Finally, as AI and digital technologies continue to expand, frameworks for evaluating human–machine co-creativity will be essential.

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