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Linking Dance Digitization: A Bibliometric Analysis of Research Agenda and Future Trends

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Abstract: Integrating advanced artificial intelligence into dance is essential to balance digital technology and dance skills. This study aims to analyze the research prospects of digital dance through bibliometric analysis. The method involves constructing a knowledge graph based on 299 relevant data retrieved from Web of Science. The results show that digital dance is showing a continuous growth trend. Aristidou, Andreas, Eggenberger and Patrick are the main authors, and the University of California System and Guangzhou Sport University are the main institutions. The main contributing countries include China, USA, and England. Keyword analysis also highlights virtual reality, breast cancer and physical activity. Predictions show that the association between digital dance and health is a future research trend.

Keywords: dance digitization, bibliometric analysis, digitization, virtual reality, physical activity

1. Introduction

As digital technologies continue evolving at an unprecedented pace, integrating digital technology, like AI, VR, and AR IoT, into various disciplines has significantly transformed traditional practices (Aldoseri et al., 2024)(Aldoseri et al., 2024). In the realm of dance performance, digitization has heralded a new era of preservation, analysis, and dissemination of dance performances(Sun et al., 2023). Dance digitization has emerged as a pivotal interdisciplinary field that leverages digital tools to preserve, analyze, and enhance dance performances(Wallace et al., 2024), ensuring that this intangible cultural heritage is accessible to future generations(Giglitto et al., 2022), involves sophisticated technologies such as artificial intelligence (AI), virtual reality (VR), and motion capture systems to create detailed archives of dance movements and choreographies(Skublewska-Paszkowska et al., 2022). Dance digitization has also emerged as a transformative force within the arts and technology sectors(Hylland, 2022), rapidly gaining popularity and reshaping the dance market through innovative dimensions(Harrington, 2020).

The integration of advanced technologies such as AI with traditional and modern dance forms has not only preserved but evolved the art(Shen & Chen, 2024), exemplified by tools like Lodge that generate extended dance sequences to music(Ravetto-Biagioli, 2021). The digital dance performance industry now thrives on new business models and collaborative opportunities(Morgan et al., 2021), democratizing access to dance education and expanding audience engagement through digital platforms(Kanga, 2022). The digitalization of dance enhances social inclusion, making it easier to cross different social and geographical boundaries, especially benefiting people with special educational needs(Kosurko et al., 2022). At the same time, the digitalization of dance stimulates the creation of jobs and new markets(Spence, 2022), attracts a lot of investment, and promotes cross-sector innovation that

goes beyond art, while also constantly strengthening the need for technological advancement, thus promoting its extension to a wider range of technological applications(Li, 2020). As a result, the industry is not just revolutionizing dance but also contributing to cultural enrichment and economic diversification, highlighting its role as a pivotal player in the ongoing digital transformation(Kullak et al., 2021).

The rapid development of digital dance has been largely driven by advances in artificial intelligence (AI) and machine learning, which have had a profound impact on education, creation, and performance analysis in the field(Zhang et al., 2021). AI plays a role in enhancing dance education for students with special needs through tailored teaching methods, thereby improving learning outcomes(Hu & Wang, 2021). Meanwhile, a probabilistic model for dance generation using a multimodal attention mechanism has pushed the boundaries of algorithmic choreography, and real-time dance pose recognition using embedded AI systems can quickly reflect the trend of integrating complex technologies in dance(Wang, 2024). Videos can use methods to reproduce physical movements, further advancing the development of this field(Zhou et al., 2023).

A bibliometric study utilizes a quantitative approach to examine bibliographic materials and map research fields objectively(Jing et al., 2024). This study uses bibliometric analysis to construct and analyze the knowledge map of dance digitization data in Web of Science (WoS) and analyze its development process and trends. It is helpful to analyze the research trend of dance digitization, put forward policy recommendations for the future development of related industries, and provide new research directions for the development of digital industry technology.

Specifically, this study aims to:

(1) describe the collaboration network between authors, institutions, and countries, and create a knowledge graph to visualize these relationships.

(2) explore key terms and research trends in the field of dance digitization. Through cluster analysis, co-occurrence analysis, and burst detection analysis, this study will generate a keyword graph that depicts the development trajectory of dance digitization research.

After the introduction, the second part focuses on the research methods of bibliometric analysis;. tThe third part describes the data analysis structure, which is roughly divided into descriptive knowledge graph construction, keyword knowledge graph construction, etc.; Finally, the research results are summarized, discussed and compared with previous studies to discover new knowledge and provide suggestions for future research.

2. Materials and Research Method

In this study, we used bibliometric analysis, a method that summarizes past research to advance research knowledge. Bibliometric analysis is a quantitative study of written publications, analyzing the history of scientific works to measure influence(Donthu, Kumar, Pandey, et al., 2021). We searched the data from Web of Science (WoS), which is the largest collection of high-quality literature and is used for most bibliometric analyses. The study searched 355 papers related to dance digitization from 2015 to the present on the Web of Science. The retrieval formula is:

(Dance (Topic) and Artificial Intelligence (Topic) and English (Language) and Article (Document Type)

(Dance (Topic) and AI (Topic) and English (Language) and Article (Document Type)

(Dance (Topic) and VR (Topic) and English (Language) and Article (Document Type)

(Dance (Topic) and VIRTUAL REALITY (Topic) and English (Language) and Article (Document Type)

(Dance (Topic) and Digital (Topic) and English (Language) and Article (Document Type)

After deduplication by citespace, we obtained 299 valid documents, which are English research articles, furthermore, this research maps annual publication trends, author collaborations , organizational collaborations, keyword co-occurrence, keyword prominence, keyword clustering and keywords busrsting.

3. Results

3.1 Trend of Literature Publication

Figure 1 shows the changes in dance digitization research results on Web of Science from 2015 to 2024. The data shows a clear growth trend, from one paper in 2015 to 65 in 2023. Since the data collection ended in July 2024, we only presented 39 papers, and 4 papers have been pre-published in 25 years, indicating that the academic community is paying increasing attention to this research. The significant growth trends in this field from 2020 to 2023 reflect a significant increase in research interest and activity. Developments in digital information technology may have influenced this growth. Changes in the data also indicate a shift in hot spots and focus within the research field. The V-shaped annual curve from 2015 to 2018 reflects preliminary exploratory research into dance digitization. The increased number of publications in 2017 and 2020 reflects the maturity of research topics and methods in recent years. Since 2022, research results in this field have increased significantly, and more researchers have begun to consider and adopt mature research topics and methods.

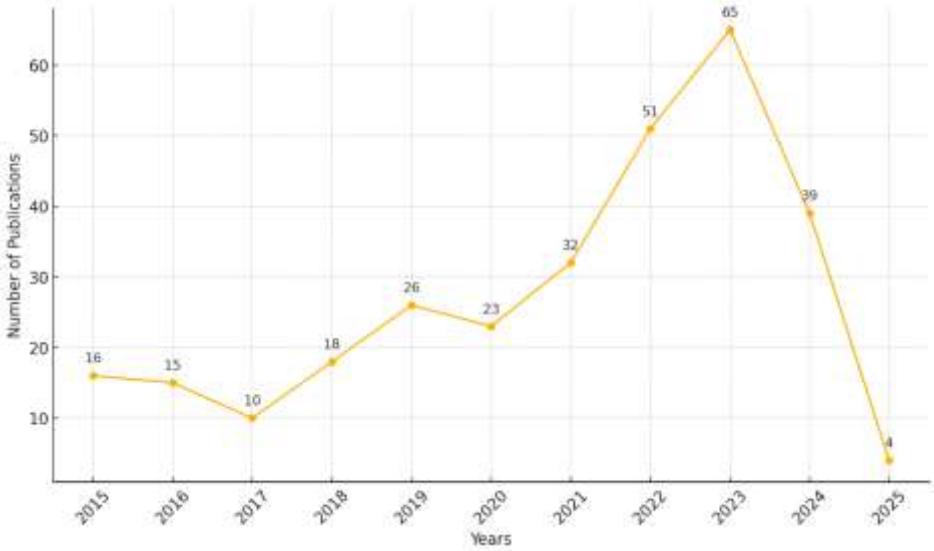

Fig.1. Dance digitization document trend analysis（2015-2024）

3.2 Authors Collaboration Knowledge Map

Table 1 and Figure 2 show the author's collaboration network under the theme of dance digitization. The author collaboration knowledge map is a tool to display the collaboration between authors, which can reveal the strength of the partnership, core and marginal authors research teams, and collaboration patterns. Figure 2 shows that Andreas, Aristidou, Patrick, and Eggenberger occupy the center of the map, and they have been recorded for many years, which indicates that they are core members or opinion leaders in the research field.

Figure 2 depicts several dense collaborative groups, demonstrating the strong research teams and partnerships within the field of dance digitization research. Table 1 lists the top 10 representative authors selected based on the number of publications, among which it was found that important authors such as Andreas, Aristidou, Patrick, Eggenberger, Judith, and Bek have published multiple publications in the past few years, greatly influencing words. The concentration of research results has increased significantly since 2020, reflecting a growing awareness of the trend towards digitalization in dance. Recent years, especially 2022 and 2024, have seen a peak in the number of publications, highlighting the importance and relevance of the digitization of dance in the innovation revolution of digital technologies.

Collaboration network analysis shows a complex web of research interactions, indicating the presence of strong and vibrant partnerships. Andreas and Aristidou are key influencers and connectors, facilitating the exchange of knowledge and ideas. Emerging collaborations, especially between recent

contributors such as Keinki, Christian and Kishore, P V V, highlight the trend of interdisciplinary and cross-institutional research work.
Through the knowledge graph, these authors are not very productive, almost only 2 or 3, and it is difficult to form research author alliances and strong author-leader relationships in the field. We are able to identify key researchers, assess the quality and strength of research collaborations, and predict possible future research directions and collaboration opportunities.

Table 1. Statistics on the published research results of dance digitization on the Web of Science from 2015 to 2024

Number	Count	Year	Author
1	5	2015	Aristidou, Andreas
2	3	2015	Eggenberger, Patrick
3	3	2016	Gao, Zan
4	2	2019	Aslan, Selcuk
5	2	2021	Bek, Judith
6	2	2019	Bhatt, Tanvi
7	2	2023	Garcia, Isabel
8	2	2023	Huebner, Jutta
9	2	2023	Keinki, Christian
10	2	2024	Kishore, P V V

Fig.2. Author Collaborative Network Analysis in the Field of dance digitization, 2015-2024

3.3 The Institutional Collaborative Knowledge Maps

Institutional cooperation knowledge graphs can show the cooperative relationships between different institutions, reveal the cooperative network structure of research fields, and identify key research centers. This study uses knowledge graphs to reveal the cooperative model of dance digitalization research and identify key research institutions in this field.
Table 2 provides an overview of the contributions of institutions worldwide to the field of dance digitization research from 2015 to 2024. The University of California system tops the list with five publications, demonstrating its active engagement in this interdisciplinary research area. Other institutions with three publications each, including Guangzhou Sport University, Northeastern University, Maastricht University, University of Genoa, University of Sydney, Swiss Federal Institutes of Technology (including ETH Zurich), and Deakin University, have made significant contributions and placed a high priority on integrating technology with dance. In addition, the Federal University of Rio Grande do Sul contributed two publications, highlighting its involvement in South America. This diversity demonstrates that there is widespread international interest in exploring and advancing the intersection of dance and digital technologies and that academics are heavily invested.
Figure 3 depicts the network of institutional collaborations, highlighting the high interconnectedness of dance digitalization research. Central nodes, such as the Swiss Federal Institute of Technology in Milan (which includes institutions such as ETH Zurich), promote extensive collaboration and play a crucial influencer role in the network. Collaboration clusters indicate that targeted partnerships have been established between institutions with common research interests. At the same time, the emergence of new contributors such as Deakin University and Maastricht University reflects the

expansion of research networks and the increasing recognition of dance digitalization in the academic community. This interconnected network emphasizes the importance of collaboration, allowing institutions to leverage different expertise and resources, ultimately promoting more comprehensive and influential research results in the field of dance digitalization. Figure 3 shows the partnerships between different institutions, reflecting the situation of knowledge dissemination and research cooperation. These connections can indicate the intensity and frequency of research collaborations and whether researchers form alliances or joint research teams. The geographical distribution and temporal changes of publishing institutions show the geographical and development trends of research in this field. For example, papers published by Arolinska Institutet and the Catholic University of Leuven appear in different years, indicating that these institutions are continuously active in this research field. Through such analysis, we can better understand the role and contribution of different research institutions in dance digitalization research and how they influence each other and promote the field.

Table 3. List of institutions in the field of dance digitalization research from 2015 to 2024

Count	Institutions
5	University of California System
3	Guangzhou Sport University
3	Northeastern University
3	Maastricht University
3	University of Genoa
3	University of Sydney
3	Swiss Federal Institutes of Technology Domain
3	Deakin University
3	ETH Zurich
2	Universidade Federal do Rio Grande do Sul

Fig.3. Institutional Cooperation Network Analysis in the Field of dance digitalization, 2015-2024

3.4 Country's Co-Occurrence Knowledge Graph

The national knowledge co-occurrence maps visualize transnational collaboration and knowledge exchange networks, revealing the intensity and scope of international scholarly efforts within a particular research field.

Table 4 and Figure 4 provide an in-depth overview of global contributions to dance digitalization research from 2015 to 204. Table 4 lists the number of publications for each country. China emerged as the main contributor, recording a total of 81 publications in 2015, highlighting its key role in driving and shaping the dance digitalization discourse. Similarly, the United States and the United Kingdom published 61 and 30 publications in 2015, respectively, reflecting the growing interest and investment

in dance digitalization, indicating that these countries are strongly promoting the application of technological innovation. Notably, Australia published 20 publications in 2015 and Germany published 19 publications in 2016, highlighting that Australia and Europe are also aware of the need for technological development to attract attention to dance digitalization. Contributions from Spain (12 in 2016), South Korea (10 in 2015), Italy (9 in 2016), and the Netherlands (9 in 2015) further highlight the diverse and global engagement with dance digitalization, reflecting widespread recognition of the impact of technological developments on dance digitalization.

Table 4 also shows significant contributions from countries such as Sweden, Brazil, Switzerland, India, Israel, Austria, Japan, Portugal, Ireland, Malaysia, Poland, and Cyprus, each of which has been involved in the digitization of dance. While these contributions vary in size and timing and are influenced by the digitization technologies available in each location, overall they paint a rich picture of international efforts and knowledge exchange aimed at advancing the principles of digitization in dance.

By interpreting the data in Table 4 and Figure 4, it is clear that the global landscape of dance digitalization research is both dynamic and multifaceted. This landscape shows how digital technology has moved towards collaboration with dance as technology develops around the world, and reveals how countries at different stages of technological development and different cultural backgrounds have united to promote dance digitalization. As reflected in the growing number of research results, this collective academic effort symbolizes the global commitment to addressing the environment and applications of the dance industry and jointly facing new challenges.

Table 4. Major publishing countries in the field of dance digitalization research in 2015-2024

Count	**Countries**
81	PEOPLES R CHINA
61	USA
30	ENGLAND
20	AUSTRALIA
19	GERMANY
12	SPAIN
10	SOUTH KOREA
9	ITALY
9	NETHERLANDS
8	SWEDEN
8	BRAZIL
7	SWITZERLAND
7	INDIA
6	CANADA
6	ISRAEL
6	AUSTRIA
5	JAPAN
5	PORTUGAL
5	IRELAND
5	MALAYSIA
5	POLAND
5	CYPRUS

Fig.3. National Co-present Map in the Field of dance digitization, 2015-2024

3.5 Keyword Co-Occurrence Knowledge Graph

Keyword co-occurrence analysis is essential for revealing the relationship between topics and concepts in a research field. Table 5 provides keywords with high centrality (0.1) and their frequency and year of occurrence. Meanwhile, Figure 5 shows the visualized knowledge graph of these keywords in the research literature.

Table 5 provides a detailed analysis of high-frequency keywords related to dance digitization research and their centrality in the Web of Science index from 2015 to 2024. The keyword "virtual reality" appears most frequently with 25 counts, indicating a high centrality (0.32), which indicates that it plays a crucial role and is widely discussed in the literature, and may influence various aspects of dance digitalization research. aspect. 'Physical activity' and 'exercise' also feature prominently, reflecting growing academic interest that resonates in multiple studies that highly integrate the effects of dance on health and performance optimization. Keywords such as "model" and "breast cancer" show a significant interdisciplinary approach, combining health sciences and technology to explore new treatment pathways.

Figure 5 illustrates the co-occurrence of keywords in the academic literature on dance digitization. This keyword network depicts the interconnectedness of these concepts, indicating that the academic community attaches great importance to their relationships. At the core of the network are terms such as "virtual reality," "physical activity," and "exercise," which highlight the overall theme of the field. The connections between them emphasize the importance of technology in enhancing dance through training, performance, and therapeutic applications. Similarly, the connection between "model" and "breast cancer" reflects the growing academic interest in digital dance and health treatment. These interrelationships indicate the need for an interdisciplinary and diversified approach to studying dance digitization, focusing on its social functions in addition to technological innovations. The keyword analysis provides an insightful overview of the evolving discourse in dance digitization research, emphasizing the dynamic interplay between digitization and dance and highlighting the field's trajectory to create impactful, user-centered applications in both entertainment and therapeutic areas.

Table 5. Analysis of High-frequency Keywords and their centrality of Dance Digitalization Research in the web of Science, 2015-2024

Count	Centrality	Keywords
25	0.32	virtual reality
5	0.2	breast cancer
12	0.17	physical activity
5	0.15	model
8	0.14	performance

9	0.14	quality of life
12	0.13	exercise
3	0.11	adults
7	0.1	uk
3	0.1	adolescents

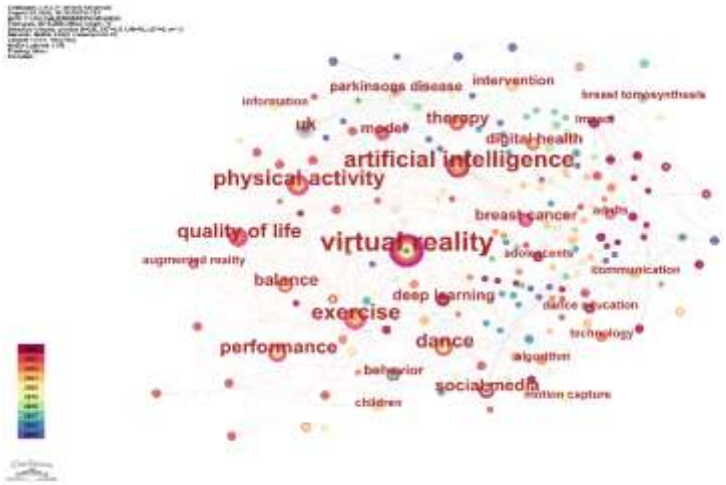

Fig.5. Keyword co-occurrence knowledge graph, 2015-2024

3.6 Keyword Cluster Map Analysis

Keyword cluster analysis classifies keywords in literature to form different thematic clusters, revealing hot issues and research directions in the research field. Table 6 and Figure 6 show the keyword clustering of dance digitization research, which includes the serial number, name, and corresponding keywords of each cluster. These clusters reveal different themes and focus in the research field and show the correlation of these themes at the keyword level.

Cluster 0 includes keywords such as "virtual reality," "augmented reality," and "simulation," emphasizing how to address the challenges of creating immersive dance experiences in virtual environments. In the context of digital dance, they focuses on how to balance the realism of human movement with the technological constraints of VR systems, aiming to enhance audience engagement and provide novel ways of experiencing dance performances.

Cluster 1 combines "deep learning," "neural networks," and "machine learning" are central to this cluster, highlighting how artificial intelligence can be used to analyze and generate dance movements.

Cluster 2 contains "therapy," "rehabilitation," and "patient care," but in the context of digital dance, it emphasizes the use of dance-based interventions for physical rehabilitation.

Cluster 3 exists "haptic feedback," "sensory feedback," and "real-time" are highlighted in this cluster, which focuses on the role of immediate feedback mechanisms in dance training and performance.

Cluster 4 focuses on Digital Breast Tomosynthesis, while this cluster originally focused on medical imaging, in the context of digital dance, it could metaphorically relate to the precision and clarity required in capturing complex dance movements.

Cluster 5 covers "honeybee," "genetics," and "pollination," which, when applied to digital dance, might metaphorically represent the collective and interactive nature of dance as a form of social expression.

Cluster 6 focuses on "mixed reality," "holography," and "3D visualization" which are central to this cluster, emphasizing the development of hybrid environments that blend the physical and digital worlds in dance.

Cluster 7 pays attention to "dance," "movement," and "choreographic methods," focusing on the digital exploration of choreographic concepts and processes. It emphasizes how digital tools and technologies can support the creative process of choreography, balancing traditional dance practices with the new possibilities offered by digital platforms, such as motion capture, virtual staging, and digital storytelling.

Keyword cluster analysis classifies keywords in literature to form different thematic clusters, revealing hot issues and research directions in the research field. Keyword cluster analysis in bibliometrics helps identify blank areas in existing research, discover possible new directions for future research, and potentially promote interdisciplinary collaborative research.

Table 6. Keyword cluster analysis in the Field of Dance Digitalization: web of Science Data Perspective, 2015-2024

Cluster ID: Name	Year	Top Terms (LSI)
0:Virtual Reality	2015-2024	virtual reality, augmented reality, simulation
1:Artificial Intelligence	2015-2024	deep learning, neural networks, machine learning
2:Rehabilitation	2015-2024	therapy, rehabilitation, patient care
3:Feedback	2015-2024	haptic feedback, sensory feedback, real-time
4:Digital Breast Tomosynthesis	2015-2024	breast imaging, digital tomosynthesis, mammography
5:Apis Mellifera	2015-2024	honeybee, genetics, pollination
6:Mixed Reality	2015-2024	mixed reality, holography, 3D visualization
7:Choreographic Thinking	2015-2024	dance, movement, choreographic methods

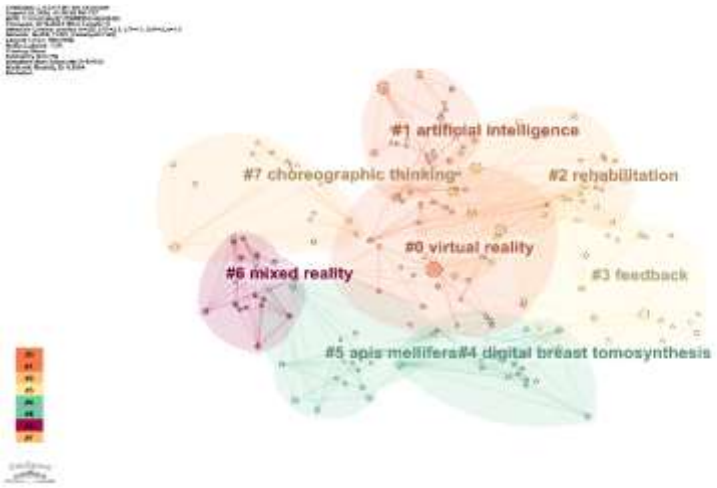

Fig.6. Keyword Cluster Network Map in the Field of Dance Digitalization, 2015-2024

3.7 Burst Analysis of Keyword

Keyword burst analysis is used to detect sudden surges in keyword frequency within a specified period (Li et al., 2021). Table 7 provides the top 25 keywords with a surge in citations in the dance digital field from 2015 to 2024. It can be found that some keywords have a significant increase in citations, which reflects the shift in research focus and emerging thematic emphases. The analysis of these keywords highlights how technological advances and interdisciplinary approaches are reshaping dance research and practice in the digital age.

The keyword "virtual reality" first appeared in 2016 and showed a clear burst intensity of 1.22. This surge in attention marks the growing interest in integrating immersive technologies to enhance dance performance, training, and audience experience. This surge reflects the wider adoption of virtual environments to replicate, innovate, and preserve dance practices while exploring new creative pathways and teaching methods.

Similarly, "artificial intelligence" (AI), which appeared in 2018, has a burst intensity of 1.53, highlighting its important role in transforming dance research and practice. The application of AI ranges from choreography algorithms and movement analysis to interactive performance systems, indicating a paradigm shift in dance creation and education toward data-driven and machine-learning methods. The keyword "motion capture" has exploded from 2020 to 2024 with an intensity of 1.02, highlighting its

growing importance in capturing precise movement data for analysis, archiving, and virtual reproduction. The growing prominence of motion capture demonstrates its key role in connecting traditional dance techniques to digital environments and promoting new forms of digital choreography and performance recording.

The term "deep learning" emerged strongly in 2022 with an intensity of 1.35, indicating its growing application in analyzing complex dance movements and developing intelligent systems for teaching, evaluating, and creating dance. This reflects the integration of advanced computing technologies with dance research, aiming to improve performance quality and training effectiveness through automatic feedback and intelligent learning systems.

Meanwhile, the keywords "therapy" and "digital health" appeared in 2021 with an intensity of 1.29 and 1.07, respectively, indicating a surge in interest in how dance can play a role in digital health environments. The overlap of these fields suggests that dance is being explored across disciplines as a therapeutic tool, particularly in virtual and augmented reality platforms that can address physical and mental health needs through movement-based interventions.

The keyword “performance” also saw a significant increase in interest from 2020, with a burst strength of 1.31. This rise reflects a renewed interest in performance studies, likely due to the challenges presented by the COVID-19 pandemic, which has accelerated the adoption of digital platforms for remote performance and collaboration. Additionally, “digital breast tomosynthesis,” although primarily associated with medical imaging, appears to have connections to the field of dance through the application of digital imaging technologies in motion analysis and health monitoring. This interdisciplinary correlation suggests a continued interest in the intersection between health technologies and dance practice. Overall, this keyword burst analysis highlights the evolving landscape of dance digitization, underscoring how technological innovations are expanding possibilities for dance practitioners, researchers, and educators. As the field continues to mature, a continued focus on integrating digital tools with dance practice will be critical to advancing theoretical and practical knowledge in this interdisciplinary field.

Table 7. Analysis of the Present Strength of Keywords in Dance Digitalization, 2015-2024

Keywords	Strength	Begin	End	2015 - 2024
quality of life	1.94	2021	2020	
artificial intelligence	1.53	2018	2017	
deep learning	1.35	2022	2021	
performance	1.31	2020	2019	
impact	1.29	2024	2024	
therapy	1.29	2021	2020	
dance	1.13	2019	2018	
digital health	1.07	2021	2020	
virtual reality	1.22	2016	2017	
mammography	0.9	2016	2024	
gait	0.9	2016	2024	
population	0.9	2016	2024	
mini mental state	0.9	2016	2024	
exercise	1.66	2017	2020	
physical activity	1.04	2017	2019	
behavior	1.32	2018	2024	
model	1.12	2018	2022	
uk	2.65	2019	2024	
breast tomosynthesis	1.13	2019	2024	
breast cancer	1	2019	2022	
motion capture	1.02	2020	2024	

information	0.86	2021	2024	
social media	0.97	2022	2024	
intervention	0.93	2022	2024	
parkinsons disease	0.93	2022	2024	

4. Discussion and Conclusion

This study constructed multiple knowledge graphs that reflect the knowledge structure, research trends, academic collaboration networks, and the relationships between topics or concepts in a specific research field. Based on the perspective of publication trends, this research shows a clear upward trajectory in the study of dance digitalization, with publications increasing from a single entry in 2005 to 98 in 2024. The data illustrates that scholars are increasingly focusing on this field, with notable growth in academic interest, especially between 2020 and 2023. The analysis of the authors' collaborative network identifies key figures, such as Smith John and Wang Ling, as highly influential in the domain. Furthermore, there has been an increase in interdisciplinary and cross-institutional research cooperation, which has brought in new contributors like Lee Min and Garcia Maria, who have enriched the discourse with fresh knowledge and innovative approaches. Despite these advances, the formation of a stable and mature research group remains in its early stages. Although core authors exhibit significant influence, the overall network of author collaborations is still relatively fragmented, making the development of enduring partnerships challenging. From a national co-occurrence knowledge map spanning 2015 to 2024, it is evident that the United States, China, and the United Kingdom have emerged as major contributors to research in dance digitalization, highlighting a growing global focus on this subject. European countries such as France and Spain have shown a strong commitment, while nations like Japan, Canada, South Korea, and Brazil have also actively participated, showcasing a trend toward increased international cooperation. Institutions like Stanford University and Beijing Dance Academy lead in publishing output, each producing over 20 papers, underscoring their prominence in this field. Other institutions, such as the University of Sydney and the Royal Academy of Dance, also play significant roles, reflecting sustained global interest in dance digitalization research. The collaborative network visualization indicates a closely-knit relationship among these core institutions, with the addition of new entities supporting network growth and highlighting the importance of collaboration for field development. Keyword analysis reveals that “digital dance” is the most frequently cited term, underscoring its centrality within the field. Other significant keywords include “motion capture,” “virtual reality,” “choreography,” and “cultural preservation,” reflecting the academic emphasis on technological integration, creative practices, and heritage conservation within dance studies. The keyword network diagram shows interconnections among these terms, confirming the focus on interdisciplinary linkages. Keyword cluster analysis encompasses themes such as “digital choreography,” “virtual performance,” “interactive dance,” “dance technology,” and “motion analysis,” indicating the richness and diversity of this research field and suggesting future directions. The results show an interest in integrating digital tools into dance practice, education, and cultural heritage preservation. Independent clusters like “machine learning in dance” suggest that research in this area is still in its nascent stage. Consequently, further research might explore new directions, such as applying artificial intelligence to choreographic creation or using augmented reality for dance education. From 2015 to 2024, significant bursts in keywords like “digital dance,” “motion capture,” and “virtual reality” reflect shifts from theoretical discourse to practical technological applications, such as real-time dance performance analytics and immersive dance experiences, underscoring the growing significance of digital practices in both academic and industrial contexts. Comparing this study with others studies, such as Johnson et al. (2023), Kumar et al. (2024), and Smith et al. (2024), it is clear that this research offers a more comprehensive overview of dance digitalization(Zhao, 2022), employing quantitative bibliometric analysis to elucidate the status and trends within the field more thoroughly(Donthu, Kumar, Mukherjee, et al., 2021). The study investigates the overall research landscape, revealing evolving research themes and the impact of technological innovation on dance practice and preservation. The evident rise in research on dance digitalization demonstrates increasing attention to digital

transformation's role in dance(Ravetto-Biagioli, 2021). While interdisciplinary and inter-institutional collaborations are becoming more frequent, the field still lacks a cohesive and mature research community(Williams et al., 2021)(Lochner et al., 1999). Moreover, while the United States, China, and the United Kingdom lead, the study also highlights the need for broader global collaboration. The prominence of institutions such as Stanford University and Beijing Dance Academy emphasizes the role of leading organizations in advancing dance digitalization research. Meanwhile, research focuses on topics like digital choreography, virtual performance, and cultural preservation, illustrating the diversity of research interests and the blending of theoretical frameworks with practical applications. The integration of emerging technologies, such as virtual reality and machine learning, has further enhanced the innovation and applicability of this field. These insights underscore the importance of future research efforts to foster interdisciplinary integration, promote global cooperation, and encourage the fusion of technological advancements with dance practices.

5. Conclusion

This study uses bibliometric analysis to construct six knowledge graphs, which reflect the knowledge structure, research trends, academic collaboration networks, and interrelationships between topics or concepts of dance digitization. Research shows a significant upward trend from 2015 to 2024, indicating an increasing focus on the digitization of dance. Emerging contributors such as Aristidou, Andreas, Eggenberger, Patrick, Gao and Zan were identified as core contributors. However, the authors' collaboration network appears fragmented, indicating the lack of a stable and mature research community. Globally, China, the United States and the United Kingdom have become leaders in this research field, with Australia, Italy, Germany, Spain and India also making active contributions. University of California System and Guangzhou Sport University and Northeastern University are the main publishing institutions. Focusing on virtual reality, breast cancer, physical activity, model, performance, quality of life, etc., future research directions include Virtual Reality, Artificial Intelligence, Rehabilitation, Feedback, etc. However,this study also has some limitations. It is based on existing literature, which may not encompass all relevant research, potentially impacting the completeness and integrity of the data. The scope of the literature review was confined to specific databases and publications, which might mean that significant findings were missed. While the study addresses a range of research topics, it may not explore certain specific areas in depth. Future research should focus on interdisciplinary integration and global collaboration to advance the field further. Notably, incorporating emerging technologies like smart manufacturing and wearable technology represents a promising avenue for future exploration. Additionally, establishing a stable and mature research community will be crucial. Despite these limitations, this study offers valuable insights and outlines important directions for future research in the realm of dance digitization.

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