Exploring Research Trends in Childcare Centres: A Scientometric Review

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ABSTRACT

This paper reports a scientometric analysis of trends in childcare centre research from 2003 to 2022 by utilising data from the Web of Science. A total of 1,291 publications were analysed, revealing key research areas and influential authors, journals, and institutions in the field. The findings show a significant rise of scholarly interest in early childhood development and a surge in publication output in recent years. It also highlights geographical distributions, with the United States, the United Kingdom, and Australia leading the research contributions. Furthermore, the co-citation analysis identified the most influential studies and keywords during the 20 years span, including "early childhood education" and "mental health". The research clusters also underscore the interdisciplinary nature of the field, linking childcare centre studies with public health, education, and social sciences. These findings provide valuable insights into the current landscape of childcare research, identifying both established and emerging trends that can inform future policy development and academic exploration.

Keywords: Childcare centres; Co-citation analysis; Early childhood education; Research trends; Scientometric analysis

INTRODUCTION

In recent decades, research on childcare centers has notably increased due to regulatory adjustments and rising need for early childhood education, reflecting wider social trends. For instance, government investment in childcare services across OECD countries rose by 20% from 2005 to 2018, indicating a trend toward prioritization to early childhood development (Kominek et al., 2024). Concurrently, demographic trends such as increased female workforce participation have raised demand for available childcare options, which informs continued scholarly work on this topic (Cluver et al., 2023). The presence of formal childcare has been associated with social indicators, including a modest increase in literacy and numeracy skills among children enrolled in these programs, as well as a notable decrease in parental stress (Bernier et al., 2024).

Moreover, there has been a observable rise in academic attention regarding the management and growth-related functions of childcare centers. For example, studies investigating cognitive development have increased considerably between 2010 and 2020, pointing to the relevance of early educational interventions (Li & Li, 2024). Research indicates that children attending formal early learning programs can experience increases in cognitive outcomes during their early years before formal schooling, suggesting the relevance of these early interventions. (Love et al., 2020). Furthermore, economic analyses suggest that government subsidies covering 50% of childcare expenses are relevant to supporting access to quality childcare particularly for low-income

households (Gonalons-Pons & Quinn, 2024). Despite these shifts, significant gaps exist in understanding the interconnected social and economic elements of childcare services across various income-based populations (Casarico & Lattanzio, 2023).

Although a numerous studies has been conducted on childcare center research, many studies have concentrated on limited aspects such as the financial outcomes and individual program. A systematic review by Niu et al. identifies important gaps in the access to structured in low-income urban areas, particularly in developing economies (Hua et al., 2024). Past literature reflects that limited financial support and ineffectively applied regulations have led to reduced-quality practices, negatively influencing developmental progress (Li & Li, 2024). Moreover, only 33% of evaluated early childhood programs have demonstrated significant positive impacts on child outcomes, which indicates a requirement for holistic policy adjustments that address obstacles to formal childcare use (Lin et al., 2023).

As childcare research continues to expand, scientometric methods have been increasingly adopted. This approach allows researchers to examine linkages between publications, journals, and authors, thus supporting the identification of patterns and omissions within the body of literature. (Chumo et al., 2022). The application of scientometric analysis in this domain can offer useful observations into existing research trends and collaborations, supporting the identification of areas for further study. Employing software like CiteSpace and VOSviewer can help researchers trace key publications and leading contributors but also identify less-studied topics requiring further attention (Gonalons-Pons & Quinn, 2024). By studying publication data and subject evolution, researchers can better understand the evolution of childcare policy and its implications, thereby adding meaningfully to both academic and real-world insight in early childhood education.

Moreover, using scientometric methods may help examine the influence of new areas of interest, such as inclusive access to care services and the application of tech-based methods in childcare, and how these affect outcomes among varied demographic segments (Hua et al., 2024). As childcare becomes an growing area of focus of early childhood education, understanding these trends through a structured research method can contribute to policy refinement that respond to family and child needs in a practical manner.

METHODOLOGY

A scientometric analysis was conducted on the recent scientific production (i.e., published papers over the last twenty years). The research framework used in this study is shown in Figure 1.

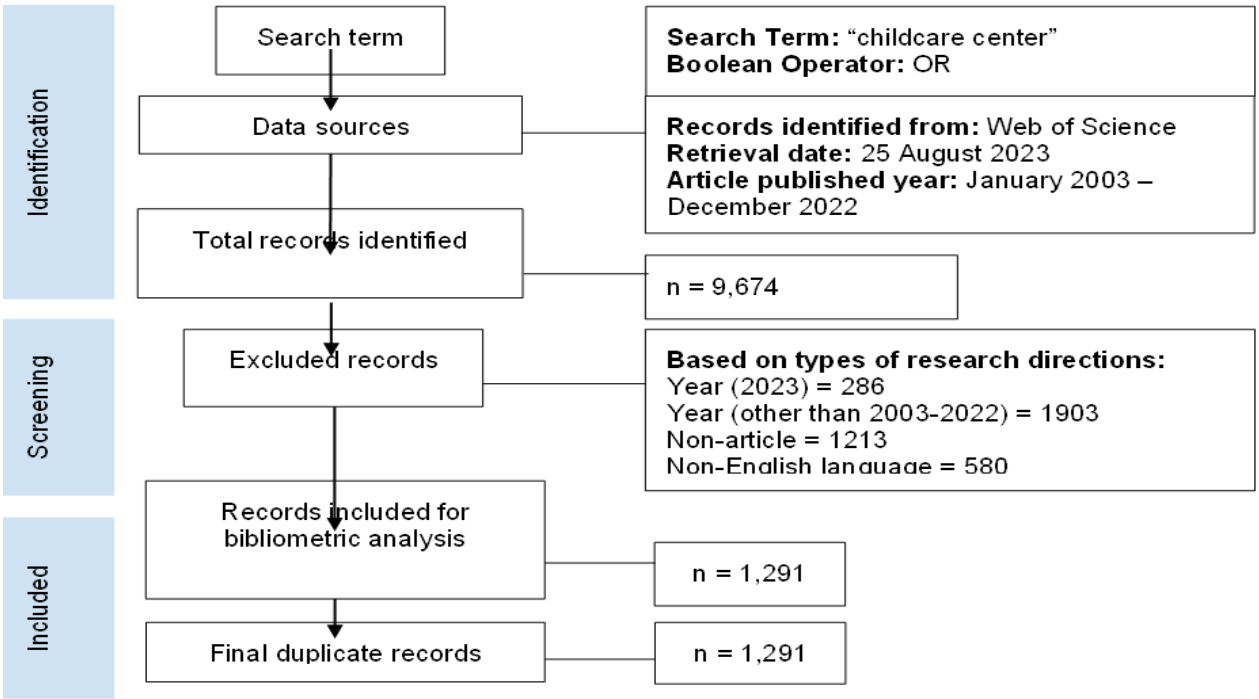

Figure 1. Methodological framework of this study.

Article Search

The main keyword of "childcare center" was initially set based on the research questions of this study. However, for the purpose of keyword enrichment, the researchers referred to past studies, searched for appropriate synonyms on thesaurus.com, and used the keywords suggested by https://www.ncbi.nlm.nih.gov/mesh. Subsequently, the keyword searches were extended to "daycare center", "babysitter, "childcare provider", "childminder", and "nurseries". These keyword combinations were processed via the advanced search function in the Web of Science database using Boolean operators. The search effort resulted in 9,674 potential articles that were identified from the Web of Science database. The Boolean search string used is presented below:

TS=((("childcare center") OR ("childcare centre") OR ("child care center") OR ("child care centre") OR ("daycare center") OR ("daycare centre") OR ("daycare") OR ("babysitter") OR ("childcare provider") OR ("child care provider") OR ("childminder") OR ("Nurseries") OR ("infant nursery")) NOT (("PLANT")))

Eligibility Criteria

Inclusion Criteria

The selection of articles for review was constrained within a 20-year timeframe, specifically focusing on publications from 2003 to 2022. This restriction was implemented in line with the notion of 'research field maturity' as defined by Kraus et al. (2020). The two-decade span is assumed to adequately encapsulate the relevant literature in this domain. Additionally, only articles written in English were included in the review to maintain clarity and consistency in terminology and concepts during the analysis.

Exclusion Criteria

A total of 3,080 articles were excluded due to their publication in non-open access journals, which rendered their full texts inaccessible. The study also excluded 580 articles written in languages other than English. Additionally, articles related to agricultural research that featured the term "nursery" but pertained to locations where plants were cultivated for transplanting, used as stock for seedlings and grafting, or intended for sale were also omitted from the study.

Data Analysis

This study utilised CiteSpace, a widely recognised tool for mining and summarising research data from the Web of Science. We specifically used CiteSpace V version 6.2.R4, Advanced, designed for 64-bit Windows operating systems. Microsoft Office Professional Plus 2019, including Excel, was also employed for data management and analysis.

Co-citation analysis was also employed in this study as a quantitative method for mapping scientific knowledge to uncover research connections and trends in specific topics, research centres, and research links. Co-citation happens when two sources are frequently cited together in other documents, indicating a semantic connection. This was achieved in the present study by evaluating the quality of variables using degree, centrality, and sigma values.

Furthermore, citation burstiness was employed to identify important keywords in the research area. Such technique detects sudden increases in citation frequency for certain articles, which are visually represented by red rings in the network diagram. Detecting citation bursts facilitates the understanding towards temporal dynamics and increased scholarly attention to specific articles, offering insights into influential contributions and significant research topics.

The research questions were addressed by visualising the publication trends, productive authors, top institutions, productive journals, and regional contributions using Excel. A dual-map overlay was used to show inter-domain specialty and specialty trends that link different research areas. Additionally, this study employed the burstiness metric to identify influential publications, top keywords, and major research trends.

RESULTS

Descriptive Analysis

Publication Trends

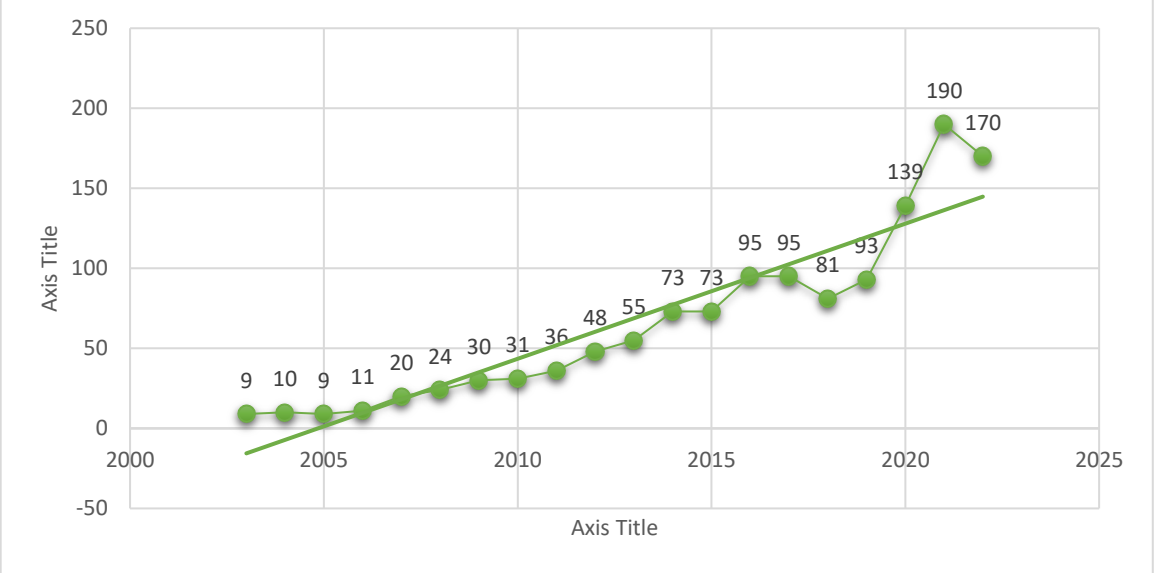

Figure 2: Number of research articles published annually since 2003.

The publication trends in childcare centre research have demonstrated a significant increase in scholarly interest since 2003. As depicted in Figure 2, the number of research articles published annually has steadily risen, reaching its peak in recent years. This surge in publications aligns with a broader global focus on early childhood education, child development, and family support systems. The growing recognition regarding the importance of quality childcare services in promoting cognitive and social development among children has fuelled such increase in research output. Moreover, as more countries implement policies and reforms to support working families, the demand for empirical research on the effectiveness and impact of childcare services has also grown. This trend is indicative of a thriving research area that is likely to continue expanding as new challenges, such as the COVID-19 pandemic, subsequently bringing attention to the vulnerabilities and needs of the childcare system.

Productive Authors

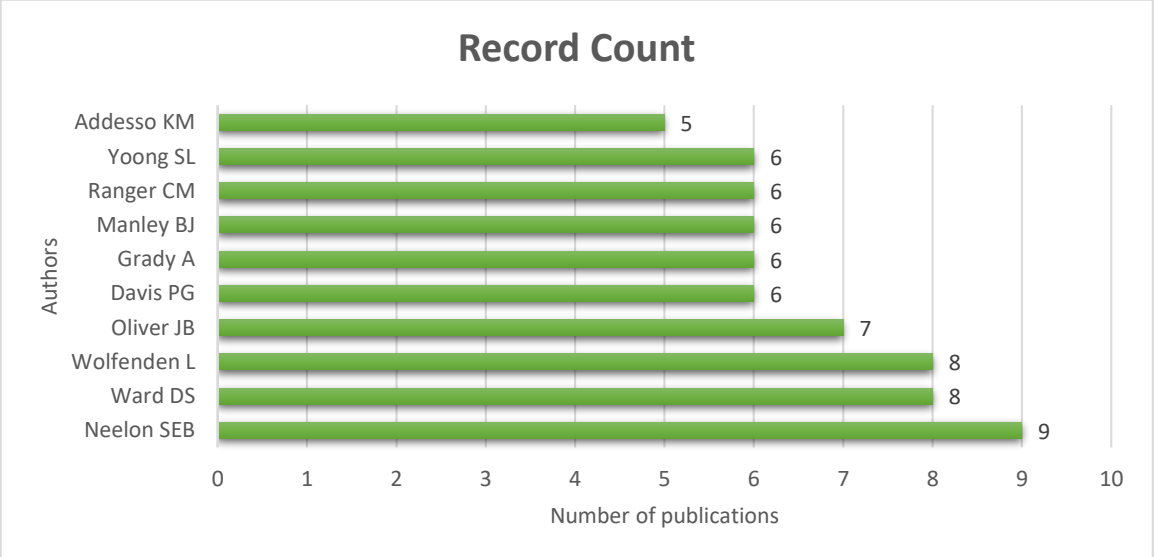

Figure 3. Top ten most productive authors for the period of 2003 to 2022

The landscape of childcare research is shaped by several highly productive authors who have made substantial contributions to the field. Figure 3 highlights the top ten most productive authors between 2003 and 2022. The most prolific author is Neelon S. E. B. with 9 publications. This is followed by Ward D. S. and Wolfenden L., each contributing 8 publications, and Oliver J. B. with 7 publications. The results show the steady research output by prominent scholars in the field of communication across the 20-year period.

Productive Journals

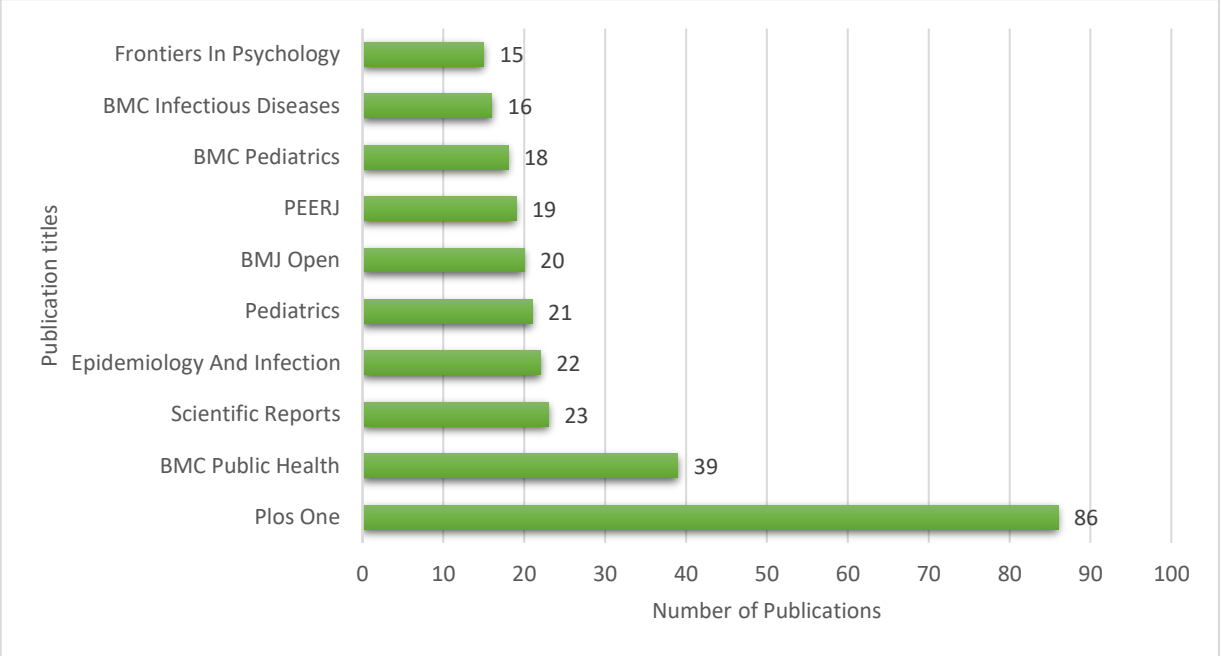

Figure 4. The number of publications published between 2003 and 2022 from the top ten journals.

The most number of publications is recorded by Plos One with a total of 86 publications, which significantly surpasses other journals. It is followed by BMC Public Health with 39 publications, Scientific Reports with 23 publications, and Epidemiology and Infection with 22 publications. Meanwhile, Pediatrics and BMJ Open have 21 and 20 publications, respectively. The results denote the leading journals in this area of study.

Top Institutions

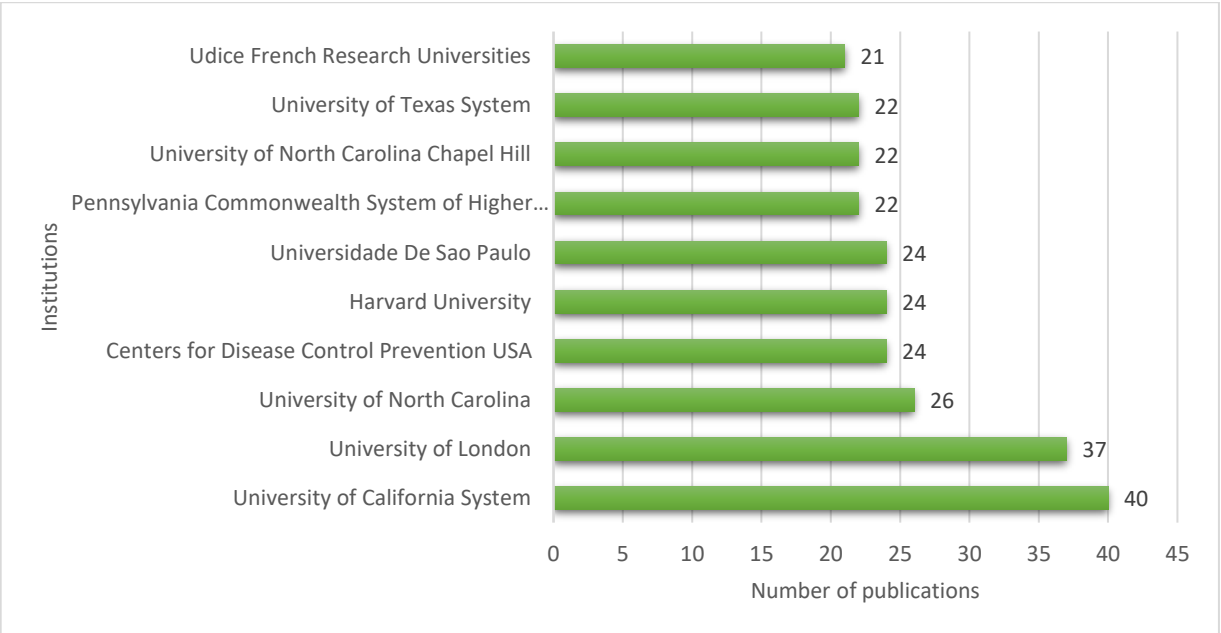

Figure 5. The number of publications from the top ten institutions.

As depicted in Figure 5, the top institutions contributing to childcare centre research are primarily located in the United States and Europe. The University of California System earns the top position in the list with 40 publications, making it the most productive institution. This is trailed loosely by the University of London with 37 publications. Another key institution is the University of North Carolina, which has produced 26 articles. The results show the major producing academic and research institutions, which have been at the forefront in terms of publication output over the past two decades. These institutions have access to extensive resources, including funding and collaborative networks, which enable them to engage in large-scale, multidisciplinary research projects. Their prominence in the research landscape highlights the institutional support for early childhood research, particularly in exploring health-related aspects of childcare, such as nutrition and physical activity. Furthermore, these institutions often collaborate with international partners, reflecting the global nature of childcare research and the shared interest in improving early childhood services across different regions and socio-economic contexts.

Regional Distributions

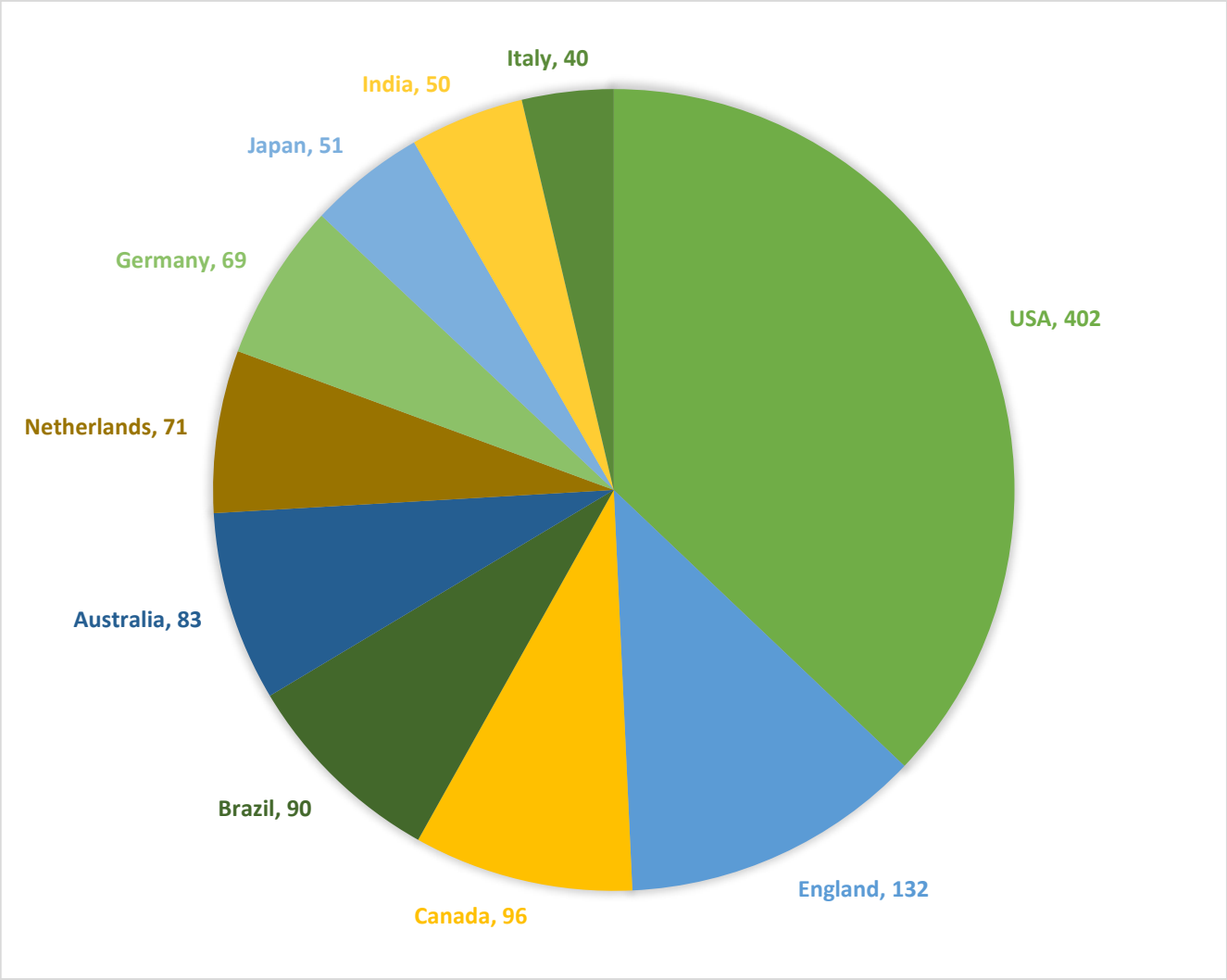

Figure 6. The number of publications published between 2003 and 2022 from the top ten countries/regions.

Childcare centre research is predominantly concentrated in several key regions, with the United States, England, and Canada leading in terms of research output. Figure 6 illustrates the regional distribution of publications from 2003 to 2022, showing that these countries have consistently produced a large volume of research in the field. The United States ranks first with a remarkable count of 402 publications, indicating its superiority in leading global childcare research. The second highest commitment to childcare research is shown by England with 132 publications, followed by Canada with 96 publications. Meanwhile, Brazil leads the childcare research scenario at the South American level with 90 publications. Similar interest and commitment is also demonstrated within the Asia-Pacific region, as denoted by Australia with 83 publications.

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The United States has a prominent lead in childcare research due to its strong economy, ample research funding, and numerous institutions focusing on child welfare. Similarly, countries like England, Canada, and Australia benefit from solid economies and government-backed research that prioritises children's well-being. European countries with established welfare systems, such as the Netherlands and Germany, also invest significantly in childcare research to support family policies. Meanwhile, Brazil has increased the research efforts to address social inequalities and improve child outcomes through better healthcare and education policies.

Scientometric Analysis

Dual-Map Overlay

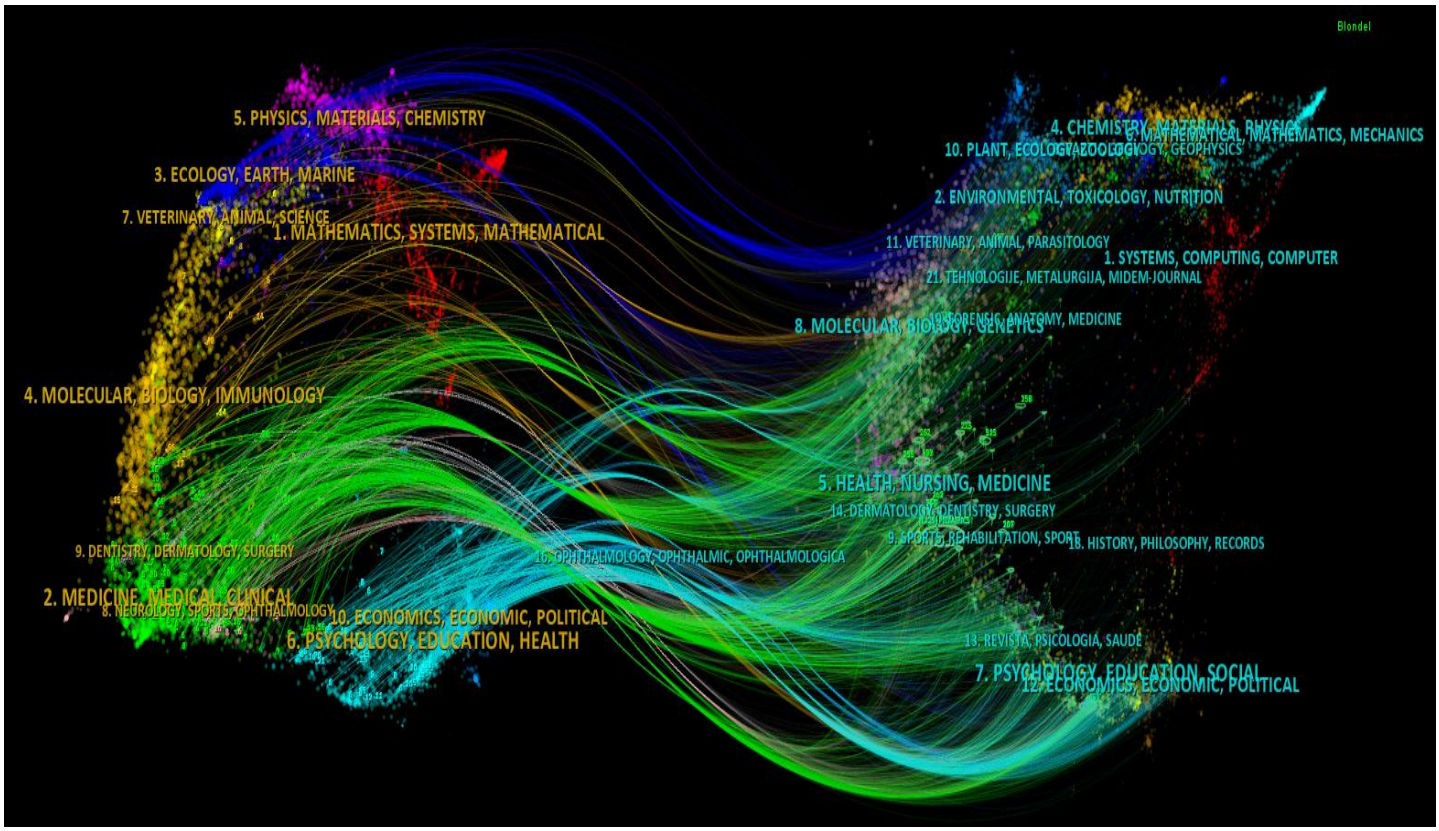

Figure 7. Dual-map overlay showing the relationships between citing and cited journals in childcare centre research.

The dual-map overlay illustrates the connection between citing and cited journals in childcare centre research across various fields. It shows how childcare centre research is shaped by interdisciplinary linkages, emphasising the need to combine studies for addressing complex childcare, health, and education challenges.

The cited journals are shown on the right side of the map and connected by coloured paths to illustrate the movement of knowledge across fields. Meanwhile, the citing journals are represented by the nine prominent clusters on the left side of the map, each representing a field of study that regularly cites studies on childcare centres. Cluster 2 contains topics related to the medicine, medical, and clinical fields while Cluster 9 consists of topics related to dentistry, dermatology, and surgery, both exhibiting significant citation activity. This suggests that a substantial amount of childcare research is being referenced in medical and health-related domains, highlighting the significance of healthcare, nutrition, and child development within the scope of childcare services.

Meanwhile, the right-hand cited map shows the most-cited childcare research journals and disciplines. Both Health, Nursing, Medicine (Cluster 5) and Psychology, Education, Social (Cluster 7) demonstrate that childcare research is multidisciplinary and influenced by health and social sciences. The pathways between the citing and cited clusters also show how childcare centre research informs healthcare, education, and social policies from multiple perspectives.

Co-Citation Analysis

Authors Co-Citation Analysis

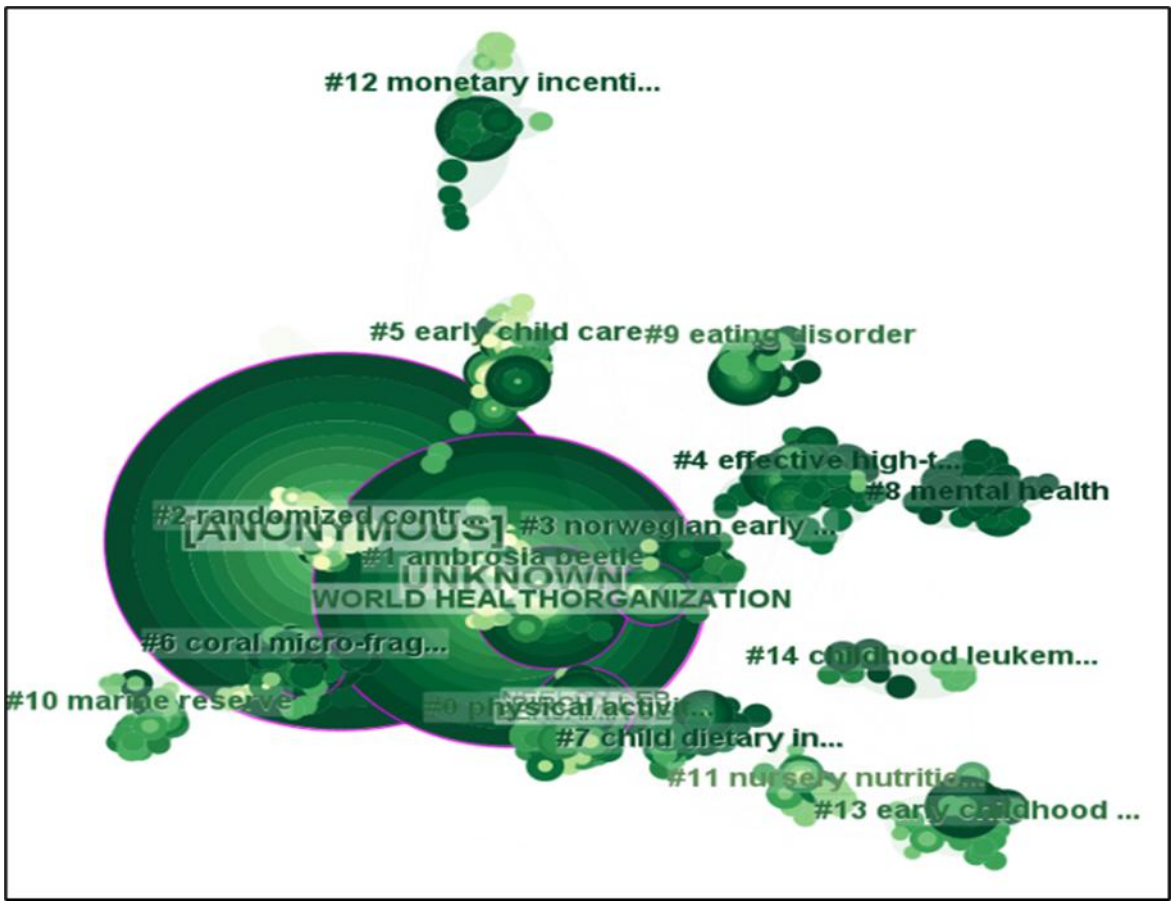

Figure 8. Knowledge maps for the author co-citation analysis.

The author co-citation analysis in Figure 8 and Table 1 indicates the most significant authors in the field of childcare centre research by reviewing their co-citation relationships. It shows how literature in this topic is interrelated, with some authors, such as Neelon (2013), Cohen (2007), and Birch (2009), are frequently cited together. The fundamental works of these authors denote their prominence in the academic community, which are extensively acknowledged and cited in later studies. The co-citation network also identifies groups of authors that work together on related subjects like family dynamics, policy interventions, and early childhood health outcomes. The high centrality and sigma scores of these authors denote their major influence over the discourse and research priorities in childcare centers.

Table 1. Top ten most influential authors in childcare centre research ranked by sigma scores, degree, and centrality.

Label	Degree	Centrality	Sigma
Neelon S. E. B. (2013)	31	0.1	1.46
Cohen J. (2007)	30	0.12	1.46
Birch L. l. (2009)	38	0.09	1.43
Reilly J. J. (2007)	25	0.09	1.43
*Nichd Early child (2003)	40	0.1	1.33
Centers for Disease Control and Prevention (2012)	20	0.06	1.26
OECD (2019)	19	0.03	1.19

*WHO (2005)	21	0.03	1.14
Pate RR (2009)	37	0.03	1.13
Tremblay M. S. (2007)	16	0.02	1.07

Degree indicates the number of direct citations received by each author while centrality shows their importance in connecting various research clusters. It outlines how childcare centre research is influenced by the notable works of individual and institutional authors. A high sigma rating indicates that the article has a significant contribution to scholarly discussion and policy development. Neelon S. E. B. (2013) dominates the list with a degree of 31 and a sigma score of 1.46. The high citation highlights the considerable impact of such work in the field of childcare, especially concerning early childhood nutrition and health. It also shows strong centrality (0.1), indicating that the author regularly makes connections between several research fields in her studies. Other highly ranked authors include Cohen J. (2007) and Birch L. I. (2009), with sigma ratings of 1.46 and 1.43, respectively. The fields of child development and behavioural treatments in early childhood have benefited greatly from the work of both authors, whose studies set the foundation for current research regarding nutrition and early health interventions in childcare settings.

Journal Co-Citation Analysis

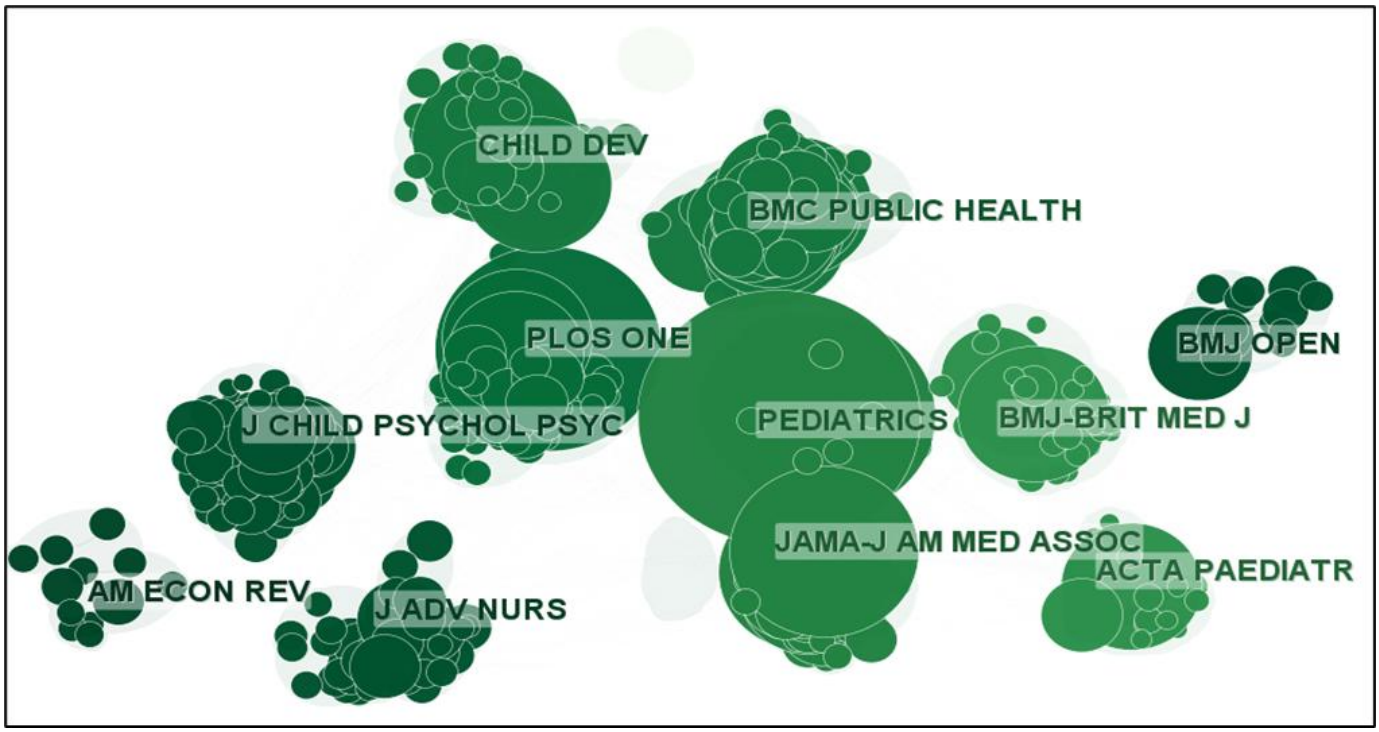

Figure 9. The knowledge maps for the journal co-citation analysis.

Figure 9 presents the document co-citation analysis results, which were generated via CiteSpace version 6.2.R4 using 2003-2022 scientometric data obtained from the Web of Science Core Collection. The g-index selection was k=25, indicating that the top 25 most-cited documents in every slice were chosen for the co-citation analysis. The network includes 664 nodes and 2,999 edges at the density of D=0.0136, which shows the real connections to the possible ones in the network. The largest connected component is 660 nodes and constitutes to 99% of the total nodes, showing a highly interconnected structure.

The relevance of the largest CC is that most of the documents are co-cited, which serves as the activity and unity signal. The modularity score of the current network is 0.5738, showing considerably high clustering. This means that while the areas are divided, they may not be highly closed. The weighted mean silhouette score is S=0.8019, which shows the quality of clustering. The harmony score Q, S is 0.669, which denotes a balance of modularity and silhouette and indicates a moderate level of structuring and consistency. The co-citation analysis results subsequently indicate a well-interconnected and relatively structured network of research components. In terms

of childcare centres, the high level of the largest component activity means a united field in which certain core studies are equally popular.

Table 2. Top ten journals in childcare centre research ranked by sigma scores, degree, and centrality.

Label	Degree	Centrality	Sigma	Year
Brit Med J	54	0.14	2.83	2003
Am J Clin Nutr	47	0.08	2.04	2003
Thesis	22	0.07	2.03	2014
Jama-J Am Med Assoc	49	0.07	1.98	2003
Am J Public Health	69	0.14	1.54	2003
Am J Epidemiol	54	0.09	1.53	2003
Int J Epidemiol	34	0.08	1.52	2005
Arch Pediat Adol Med	40	0.06	1.46	2004
J Pediatr-Us	39	0.04	1.37	2003
Appetite	28	0.06	1.22	2005

The corresponding sigma scores for the top ten journals regarding to their influence and novelty in research on childcare centres are shown in Fig. 9 (citations bursts) and Table 2 (centrality), respectively. Degree represents the number of direct citations that each journal has with other journals while centrality assesses the prominence of a journal in connecting research from different clusters. The resulting sigma score encompasses centrality and citation bursts, thus indicating the total influence of a journal. A high sigma score indicates that the journal has made essential contributions in defining the discourse of childcare research.

Brit Med J had the highest sigma score of 2.83 with degree and centrality scores of 54 and .14, respectively. Hence, it stands as the most influential journal in childcare centre research). It is closely followed by Am J Clin Nutr with a sigma score of 2.04 and a degree of 47. This journal has been a prominent gateway to research in the field of early childhood nutrition and thus plays a pivotal role within studies that examine the crossroads between childcare centres and child health outcomes. Other journals like Jama-J Am Med Assoc, Am J Public Health, and the American Journal of Epidemiology also stand as the cornerstone resources for public health and epidemiological studies in children as well as childcare. These publications have been critical voices in the delivery of research that explores the health effects on childcare environments, from disease prevention to early interventions.

Document Co-Citation Analysis

The co-citation network was constructed using 759 nodes, which represent individual documents with a total of 1,866 edges (co-citation links). It revealed an average node degree of $\langle k \rangle = 4.9088$ per document, also referred to as the density R-value, which is greater than that generated by random chance alone; noticeable patterns occur at slightly higher densities for some sub-networks extracted from this data shown below [27]. We applied the g-index ($k = 25$) selection criteria whereby the top most-cited articles in each quartile of data were included. A structure of 375 documents (49% of the network) defines a large connected component (CC) that represents the correspondence to some key, highly linked papers. This means that almost 50% of the publications in the network are grouped together at a relatively high density with strong co-citation ties.

The modularity score of 0.8617 indicates the presence of well-defined clusters within the network. It shows that the document clusters are distinct from one another, which is a key measure of network structure quality. The weighted mean silhouette score of 0.937 suggests a high level of internal consistency within clusters, indicating that the papers within each cluster are highly similar in terms of their citation patterns. The harmonic means of 0.8978 further reinforces the robustness of the clustering, combining both quality (Q) and silhouette (S) scores.

The citation analysis offers insight into the most influential publications in promoting the development of childcare centre research over time.

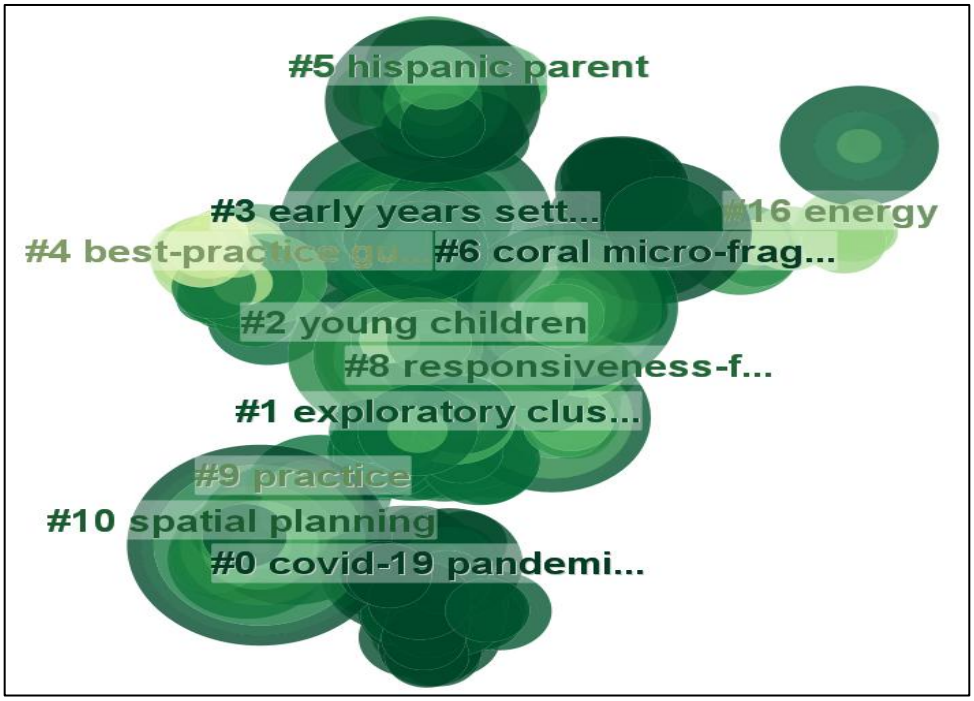

Figure 10. The knowledge maps for the document co-citation analysis.

Table 3. Top ten influential articles in childcare centre research ranked by sigma scores, degree, and centrality.

Label	Degree	Centrality	Sigma	DOI
Ogden C. L. (2014)	16	0.02	1.1	10.1001/jama.2014.732
Pate R. R. (2004)	24	0.02	1.07	10.1542/peds.2003-1088-L
Bower J. K. (2008)	27	0.01	1.04	10.1016/j.amepre.2007.09.022
Pate R. R. (2008)	16	0	1.01	10.1111/j.1746-1561.2008.00327.x
Larson N. (2011)	39	0.15	1	10.1016/j.jada.2011.06.007
Beck M. W. (2001)	6	0.02	1	10.1641/0006-3568(2001)051[0633:TICAMO]2.0.CO;2
Cohen J. (1988)	11	0.12	1	
Braun V. (2006)	12	0.07	1	10.1191/1478088706QP063OA, 10.1191/1478088706qp063oa
Benjamin S. E. (2007)	25	0.03	1	10.1186/1479-5868-4-29
Neelon S. E. B. (2011)	15	0.01	1	10.1016/j.jada.2011.02.016

Table 8 shows the top ten articles in childcare centre research with the highest sigma scores, combining both centrality and citation burstiness. Degree denotes an article's direct connections with the network (i.e., citations) while centrality describes its prominence in linking clusters of research. Sigma score is a global measure that considers the impact of an article in terms of centrality and magnitude within citers, with higher scores indicating highly influential studies.

Ogden C. L. (2014) ranks first in the list with a sigma score of 1.1 and a degree of 16. This indicates its substantial

influence on childcare centre research, especially concerning child health outcomes following its citation by the Journal of the American Medical Association (JAMA). This article, along with Pate R. R. (2004) and Bower J. K. (2008), has been widely cited and plays a key role in shaping the research on physical activity, childhood obesity, and preventive measures in childcare settings.

Meanwhile, Larson (2011) obtained the highest degree of 39 and an average intrinsic sigma score of 1. It indicates that the work is central to many research topics, particularly those related to nutrition and public health in childcare environments. This shows also that Larson's research has been fundamental for the field of public health and in studies on care, providing evidence to understand concerns about children's nutrition and activity mandates per institution.

More generally applicable foundational works also appear on this list, including the statistical power analysis by Cohen (1988) and the thematic analysis by Braun (2006). Despite not being applied within the context of childcare centres, these articles are important to research methodology and have been widely used by researchers investigating the influence of childcare settings on children's development.

Cluster Analysis

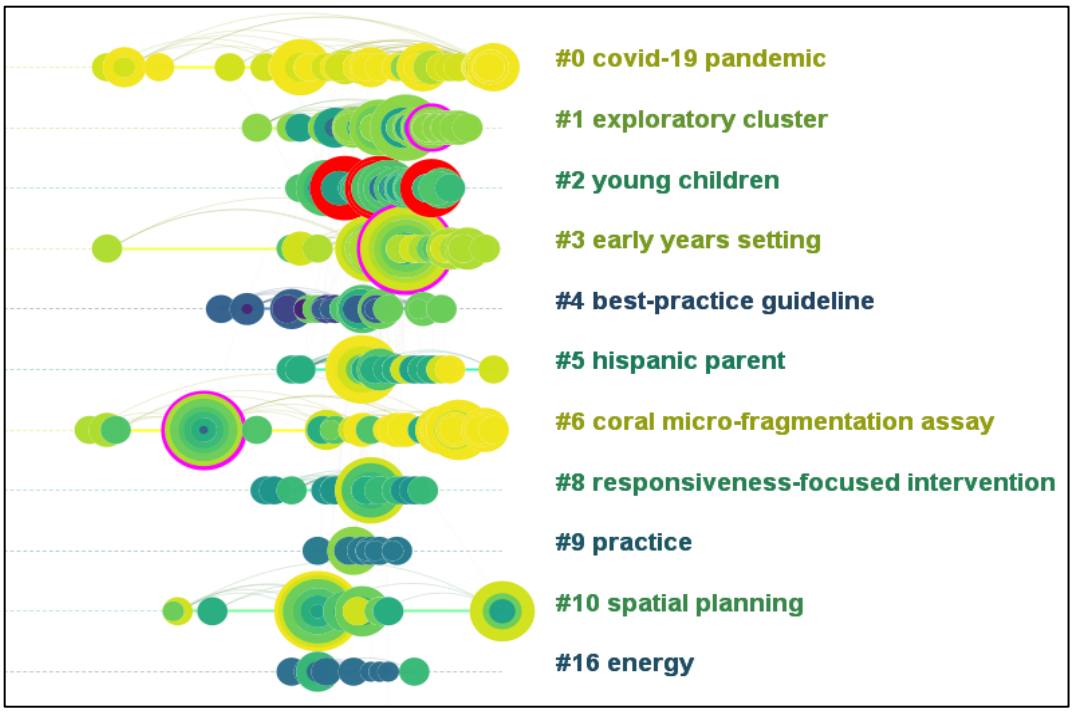

Figure 11. Lifetimes and significance of the top ten document clusters in childcare centre research.

Figure 11 provides a comprehensive overview of the thematic areas in childcare centre research, demonstrating both the historical progression of key research topics and the emergence of new, critical areas of study.

Table 4. Top ten group clusters in childcare centre research based on the keyword "childcare centers".

ClusterID	Size	Silhouette	Label (LLR)	Average Year
0	57	0.96	Covid-19 Pandemic	2011
1	56	0.848	Exploratory Cluster	2010
2	52	0.929	Young Children	2009
3	39	0.947	Early Years Setting	2010
4	37	0.954	Best-Practice Guideline	2004
5	33	0.896	Hispanic Parent	2008

6	33	0.957	Coral Micro-Fragmentation Assay	2007
8	19	0.998	Responsiveness-Focused Intervention	2005
9	16	1	Practice	2006
10	14	0.991	Spatial Planning	2002
16	10	0.974	Energy	2005
17	9	0.991	Early Childhood Education	2012

Table 4 illustrates the ten most frequently examined group clusters in childcare centre research under the keyword "child care centres". Each cluster is represented by its size, silhouette score, label (LLR), and average year. ClusterID indicates the group number while Size refers to the number of documents in each cluster. The Silhouette score measures the consistency and quality of the clustering, with values closer to 1 indicating higher reliability. Label (LLR) describes the central theme of each cluster and Average Year is the median publication date for documents in that cluster, which shows when themes represented in the given label were strongest.

The data in Figure 11 and Table 4 shows that the largest cluster is Cluster 0, which consists of 57 documents and is labelled as "COVID-19 Pandemic", with an average year of 2011. This reflects a significant body of research addressing the impact of the pandemic on childcare centres, including operational changes, challenges in providing care, and policy adaptations. Although the average year is 2011, the pandemic's influence on this research has likely extended into more recent years due to its global impact.

Cluster 1, labelled "Exploratory Cluster," contains 56 documents and focuses on exploratory research into various aspects of childcare services. The average year for this cluster is 2010, suggesting that the foundational studies in this area were conducted around this time. Furthermore, the clusters labelled "Young Children" (Cluster 2, 52 documents) and "Early Years Setting" (Cluster 3, 39 documents) highlight the research focusing on early childhood development and the educational settings for young children. These clusters have the average years of 2009 and 2010, respectively, indicating that these topics were highly researched during that period. Other clusters, such as "Best-Practice Guideline" (Cluster 4, 37 documents) and "Early Childhood Education" (Cluster 17, 9 documents), represent significant bodies of research focusing on establishing guidelines for childcare providers and enhancing early childhood education. The average years for these clusters are 2004 and 2012, respectively, reflecting ongoing efforts to improve childcare standards and education practices.

In summary, Table 1 offers a systematic view of thematic clusters in childcare research practice, concerning the extent of diversification within each topic and when observed most significantly. These silhouette scores revealed that the clusters are well-separated, especially Cluster 9 "Practice" which has a perfect silhouette score of 1, signifying a highly consistent and focused research area.

Burstiness Analysis

Document Burstiness Analysis

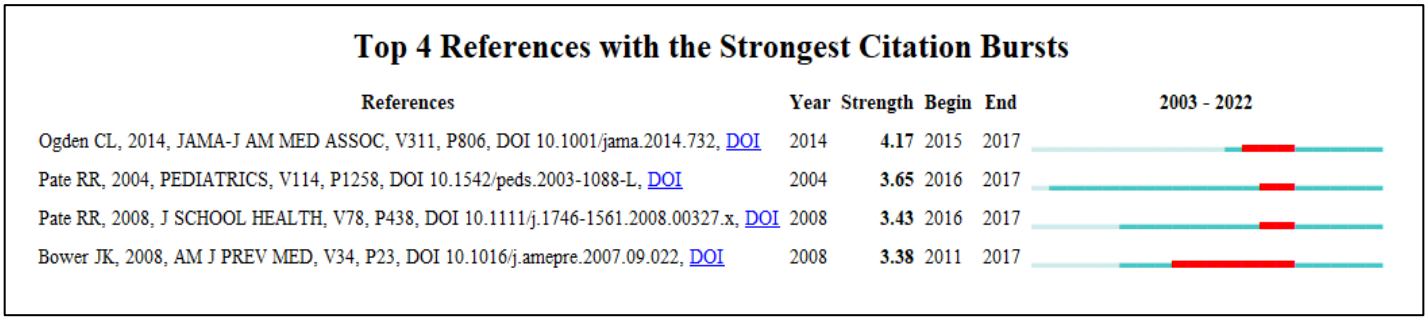

Figure 12. Top four references in childcare centre research with the strongest citation bursts from 2003 to 2022.

Figure 12 illustrates the four references in childcare center research with the largest citation bursts between 2003

to 2022. The periods when these references were most cited are indicated by the red bars. The frequency at which one particular reference has been cited increases significantly over time as reflected by its increasing influence within the research community. The highest burst strength was recorded by Ogden C. L. (2014) at 4.17, which was published in the Journal of the American Medical Association (JAMA) and covered the period of 2015 to 2017. The work has been highly influential on the childcare center research landscape during this time, especially in areas related to child health. The two publications by Pate R. R. (2004, 2008) are equally impactful with the burst strengths of 3.65 and 3.43, respectively. These articles were published in Pediatrics and the Journal of School Health and reflect significant contributions towards the understanding of physical activity and health in early childhood settings. Finally, the work by Bower J. K. (2008), which was published in the American Journal of Preventive Medicine, has a burst strength of 3.38 and covered the period of 2011 to 2017, further emphasising its impact on early childhood health interventions. These papers experienced peak citation activity during their burst periods, suggesting their prominent impact on research discussions, policy implications, and practices in childcare settings.

Keyword Burstiness Analysis

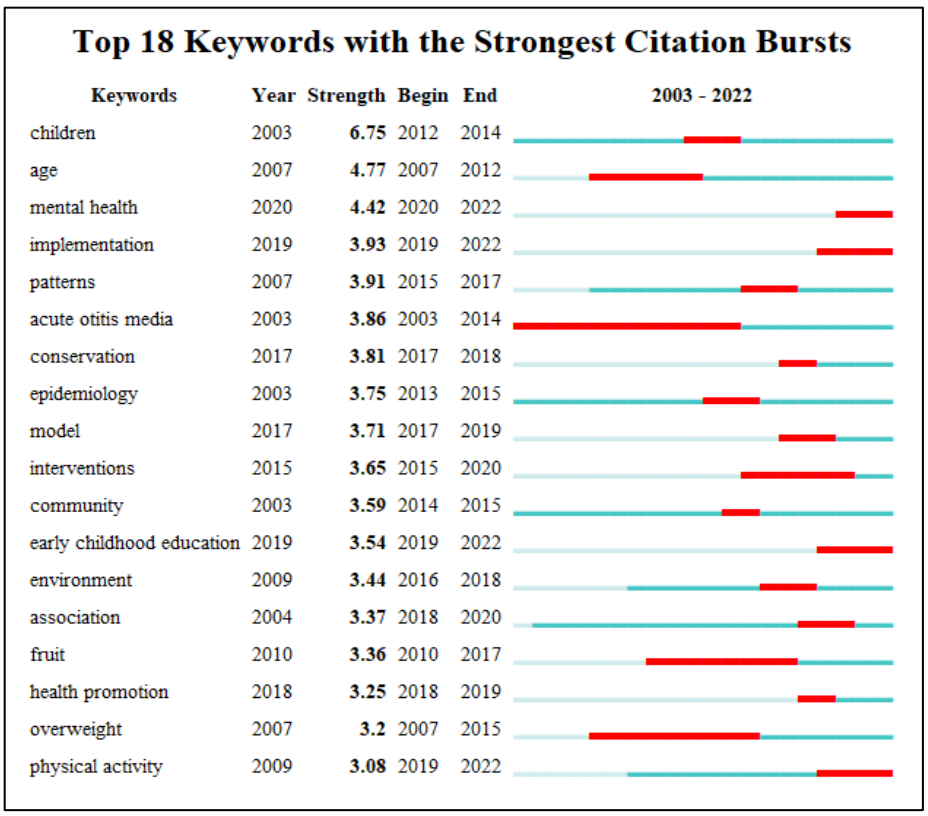

Figure 13. Top 18 keywords with the strongest citation bursts in childcare centre research from 2003 to 2022.

Figure 13 shows the top 18 keywords in childcare center research with the strongest citation bursts from 2003 and 2022. The red bars indicate the time span during which these keywords were most heavily cited and offer a visualisation of recent and well-known research topics. These trends provide important information about changes in academic and policy interests over time.

The keyword "children" shows the highest burst strength of 6.75 from 2012 to 2014. It suggests that during this time, research on childcare centres heavily concentrated on children-related issues due to an increased interest in child development, health, and education. Similarly, "age" had a significant burst strength of 4.77 between 2007 and 2012, highlighting the importance of age-related studies in early childhood development during that time.

Another notable keyword is "mental health" with a burst strength of 4.42 circa 2020 to 2022. It reflects the recent surge of interest in mental health issues among children, especially during the COVID-19 pandemic. Keywords like "implementation" and "early childhood education" also experienced strong bursts of 3.93 and 3.54 from

2019 to 2022 and 2019 to 2022, respectively. This indicates a growing emphasis towards implementing effective policies and educational strategies in childcare centres.

Meanwhile, keywords like "epidemiology", "interventions", and "community" highlight the public health aspect of childcare research while "physical activity" and "overweight" focus on physical health outcomes. These bursts suggest a multidimensional research landscape where childcare centre studies explore a wide array of issues ranging from health to education and social dynamics.

DISCUSSION

This paper offers a scientometric analysis of past studies to explore the themes and trends in childcare centre research. The results show an increasing number of publications in recent years, suggesting the rising recognition towards childcare services as an important parameter for early childhood development. An increasing trend was also observed for academic interests as part of the global endeavours to enhance childcare practices and policies. Moreover, this study found several notable contributors (i.e., prolific authors, top institutions, and journals) to the field of study, thus demonstrating the collaborative nature of the discipline. Similar quality is also exemplary regarding the geographic distribution of the publications. Although the United States and Europe are leading in research output across this landscape, a substantial contribution is also offered by several regions while others remain lagging. These findings suggest that there is a rapidly changing landscape in childcare centre research, highlight the varied focuses of previous studies, and suggest potential key areas for future research endeavours.

This study contributes to the body of knowledge pertaining to childcare centres as well as its quality and impact in social intervention and educational institutions by shaping what is currently known about this particular theme. The scientometric analysis reported the growing academic attention to early childhood education to promote positive developmental outcomes in children. Researchers in this field encompass those from public health, psychology, and education communities. These findings bear important implications for various stakeholders and imply an urgent need to invest in childcare services, especially in areas where the childcare system is poorly developed. There are also broader implications for practitioners, including government policies and institutional support that can enable more high-quality childcare provisions. Finally, the findings highlight underexplored areas that require further investigation, thus offering a guide and direction for future research.

Despite the extensive review of childcare centre research, this study has several limitations that require attention. First, the analysis focused on Web of Science data and might have missed some publications. Therefore, the use of additional databases, such as Scopus or PubMed, can offer a better overview. Second, the restriction to studies published in English might have excluded research that is written in other languages, thus limiting the generalisability of the findings. Finally, scientometric analysis has been criticised for its heavy reliance on quantitative measures, such as publication counts and citation rates. Such approach can potentially overlook important qualitative research dimensions, including how findings can lead to practical changes at state levels or even contribute directly towards future policy implementation. This is equally crucial for understanding the full impact of childcare research.

RECOMMENDATIONS FOR FUTURE RESEARCH

Further research in childcare centres must expand to new areas of interest and wider geographical settings, particularly within low- and middle-income countries where good quality early childhood education remains scarce. Longitudinal studies can also be conducted to explore whether children can better benefit from staying at home as opposed to nursery and the role played by early childhood education. Potential actions include integrating new technologies like digital learning platforms and how these innovations can contribute towards the improvement of quality childcare services. Additionally, future research should delve into a variety of disciplines (e.g., education, psychology, public health, and social policy) that can work together on the multiple barriers facing childcare.

CONCLUSION

This study explores the development and key trends of empirical research in the field of childcare centers. The

findings suggest that more regional and global publications have been focusing on childcare services over the years with a growing recognition of their importance for early childhood development and family welfare. Key contributors, prolific authors, prominent institutions, and top journals were also determined, indicating a more collaborative interdisciplinary approach in research within this domain. The study also found several gaps, particularly in underrepresented geographies and the call for wider consideration across multiple socio-economic development contexts.

Although the study contributes valuable information and further understanding of this critical area, it also highlights how methodological choices like using a single database and quantitative measures can limit interpretation. Future directions include broadening the scope of research to other data sources, a focus on qualitative studies, and the identification of emerging trends such as digital innovations in childcare services. In conclusion, this study serves to chart and describe existing research on childcare centres and set a direction for future investigation for improving the quality, availability, and use of childcare services globally.

Supplementary Materials

https://www-webofscience-com.ezaccess.library.uitm.edu.my/wos/woscc/summary/03cae1a0-9c6e-46e1-88fc-cd9d2753bfd0-9f94d851/relevance/1

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