

**A Decade of Fundamental Movement Skills in Elementary Schools: A
Bibliometric Study Scopus Database 2014-2023****Sulthan Hadist Ismaiedh Cukarso^{1✉}, Sujarwo², Yasep Setiakarnawijaya³, Oman Unju
Subandi⁴**State University of Jakarta, Jakarta, Indonesia¹²³⁴**Article History**

Received March 2024
Accepted June 2024
Published Vol.13 No.(2) 2024

Keywords:

Fundamental Movement
Skills; Elementary School;
Bibliometric Analysis

Abstract

Fundamental movement skills are very important and have an impact on children's development. This research aims to explore and analyze articles related to fundamental movement skills in elementary schools over the last decade through a bibliometric study in order to explore a research roadmap regarding fundamental movement skills in elementary schools. This bibliometric study takes four stages, namely: (1) searching for articles; (2) classifying articles; (3) checking and completing article metadata; and (4) carrying out bibliometric analysis. This study explores seven findings related to (1) publication trends in fundamental movement skills in elementary schools in 2014-2023; (2) citation trends for fundamental movement skills in elementary schools in 2014-2023; (3) author collaboration that has the strongest link to publications on fundamental movement skills in elementary schools in 2014-2023; (4) Development of author keywords in publications on fundamental movement skills in elementary schools in 2014-2023; (5) Development of abstracts on publications on fundamental movement skills in elementary schools in 2014-2023; (6) institutional collaboration on the publication of fundamental movement skills in elementary schools in 2014-2023; and (7) Distribution of countries that contributed to the publication of fundamental movement skills in elementary schools in 2014-2023. Based on these seven findings, it can be concluded that there is a lack of attention from academics and researchers to fundamental movement skills in elementary schools. This can be seen from the very minimal number of publications in the last decade.

How to Cite

Cukarso, S. H. I., Sujarwo., Setiakarnawijaya, Y., & Subandi, O. U. (2024). A Decade of Fundamental Movement Skills in Elementary Schools: A Bibliometric Study Scopus Database 2014-2023. *Journal of Physical Education, Sport, Health and Recreation*, 13 (2), 229-237.

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✉ Correspondence address :
E-mail : sulthan_1606822015@mhs.unj.ac.id

INTRODUCTION

Fundamental movement skills are currently a very common topic that is explored globally from various perspectives (Libertus & Hauf, 2017; Wibowo, 2024). The prevalence of adolescents facing fundamental movement skills challenges continues to increase (Plumb, Hands, McIntyre, & Timler, 2021). Furthermore, fundamental movement skills are very important and have an impact on children's development (Eddy et al., 2020; Lingam et al., 2012). These skills are the basis for mastering more complex and advanced sports skills, so they are important for children's involvement in sports and physical activity (Jacob et al., 2023; Zhang et al., 2023). Fundamental movement skills also help children develop the muscle strength, coordination, balance, and body control needed to participate in sports and daily physical activities (Sofyan et al., 2022).

However, the current phenomenon shows that the problem that occurs is that most schools and parents do not understand the importance of stimulating fundamental motor skills and focus more on improving children's cognitive abilities, thus having an impact on children's motor skills (Mahmud, 2019). Children's inability to regulate their body balance, accuracy in throwing and catching objects, and dexterity in moving are also obstacles to their gross motor development (Mayasari et al., 2022). Facts also show that children's physical activity at school has a short duration (Kremer et al., 2012; Nascimento et al., 2023). In fact, it is very important to learn fundamental movement skills thoroughly for children (Gustian, 2021; Kustari & Mahendra, 2020), which will help increase children's self-confidence, independence, and creativity in moving and doing activities (Nugroho et al., 2021) and encourage improved psychological and mental health (Lobstein et al., 2015; Suryadi et al., 2024).

Fundamental movement skills refer to a set of basic movements that form the foundation for more specialized movement activities (Lopes et al., 2021; Newell, 2020; Zeng et al., 2019). Increasing evidence suggests that the effectiveness of fundamental movement skills is tied to an individual's health at all stages of life (Robinson et al., 2015; Utesch et al., 2018). Various kinds of literature have studied fundamental motor skills, such as Nopembri and bin Shahril (2024) who conducted research related to fundamental motor skills and motor coordination performance with elementary school children in West Sumatra, Indonesia. The results of the research show that

children in urban areas have fundamental motor skills and significantly superior motor performance compared to children in rural areas. Furthermore, Samodra et al. (2023) who conducted a comparative analysis of the gross motor skills of elementary school children in hilly and coastal areas, found that the results of their research showed that there were significant differences in gross motor skills between children in hilly areas and coastal areas. Children in coastal areas have superior gross motor skills compared to children in hilly areas. In contrast to previous research, Ningrum et al. (2024) provide community service by introducing fundamental movement skills in elementary schools through games and media modifications. The results show that games and media modifications can motivate and attract children's interest, so they are willing to train their activities and develop their muscles, reduce boredom, and improve children's skills in a fun way.

By considering these studies, this research is believed to be important for mapping bibliographies from certain fields (Fernandez-Batanero et al., 2020; Otchie & Pedaste, 2020), to examine the direction of research development related to fundamental movement skills in elementary schools. Therefore, this research aims to explore the literature on fundamental movement skills in elementary schools in international journals indexed by Scopus from 2014 to 2023. To achieve the research objectives, seven questions were formulated:

- Q1: What is the development of research on fundamental movement skills in elementary schools in 2014 - 2023?
- Q2: How is the development of research quotes on fundamental movement skills in elementary schools in 2014 - 2023?
- Q3: How is the collaboration between authors on research on fundamental movement skills in elementary schools in 2014 - 2023?
- Q4: What is the development of keywords in fundamental movement skills research in elementary schools in 2014 - 2023?
- Q5: What is the progress of the abstract on fundamental movement skills research in elementary schools from 2014 - 2023?
- Q6: How is the collaboration between institutions on research on fundamental movement skills in elementary schools in 2014 - 2023?
- Q7: Which countries contributed to the 2014 - 2023 fundamental movement skills in elementary schools research?

METHODS

A bibliometric study using systematic and explicit mapping methods is the design of this research (Batanero et al., 2019; Hudha et al., 2020; Muhtar et al., 2021). Bibliometric analysis is a quantitative research method that aims to analyze bibliographic data in the form of journal articles (Sukiri et al., 2023). Apart from that, bibliometrics has a function, namely to determine authorship and citation patterns in an area over a certain period of time (Prabowo et al., 2022; Sahudi et al., 2022), as well as provide an overview of regional dynamics (Mathankar, 2018; Öref & Karagöz, 2019a, 2019b). To analyze bibliometric data, several types of software are needed that are used as analytical tools, such as Publish or Perish (PoP), EndNote, VOSviewer, GPS Visualizer, and Maps.co (Van Eck & Waltman, 2010, 2014; Zupic & Čater, 2015).

Bibliometric research has four steps, including bibliographic search and examination, bibliographic filtering, bibliographic refinement and completion, and bibliographic analysis (Julia, Dolifah, et al., 2020; Julia, Supriatna, Isrokatun, Aisyah, Hakim, et al., 2020; Julia, Supriatna, Isrokatun, Aisyah, Nuryani, et al., 2020).

The initial step in this research requires software called Publish or Perish (PoP) to search bibliographic databases (Julia, Supriatna, Isrokatun, Aisyah, Nuryani, et al., 2020). PoP is software that presents publication search results according to what is searched for. This software was initiated by Harzing.com. Meanwhile, Scopus is a database source for bibliographic searches provided by PoP software, and Scopus is one of the largest databases that provides peer-reviewed literature (Ballew, 2009; Kumar et al., 2023), therefore, Scopus was chosen as the database in this research. Scopus also has a much wider product variety than other repositories (El Archi et al., 2023; Salisbury, 2009) and it contributes approximately 70% more publications compared to WoS (López-Illescas et al., 2008; Shareefa & Moosa, 2020). The criteria set in this research are all bibliographies included in the analysis and include the following three aspects: (1) The type of bibliography is only journals. This is because journals are a collection of scientific works published over time and must also go through a peer-review stage carried out by reviewers who are experts or academics in the field being studied (Wajdi et al., 2017) (2) search for articles with titles including "Fundamental Movement Skill" OR "Fundamental Motor Skill" AND "Elementary School" OR "Primary School"; and (3) limitation to the search year, namely the period 2014–2023 (the

last 10 years). This time period was taken on the basis of the current level in the literature study. The bibliographic search results above are then saved in EndNote X9 software and saved into a CSV file, which can be opened via Microsoft Office Excel. The file is saved, checked, and equipped with meta data.

Bibliography sorting and selection is carried out using several criteria, namely: (1) English language journals; (2) contain context regarding Fundamental Movement Skills, Fundamental Motor Skills, Elementary School, and Primary School; and (3) are published by an established and reputable bibliographic database publisher (Julia, Dolifah, et al., 2020). Very bibliography entered or removed from the bibliometric analysis process will be checked by searching the Scopus database site extracted from the PoP software. So some bibliographies that appear in PoP software searches are not equipped with abstracts, and keywords are not selected.

The initial search using PoP yielded results of 29 bibliographies, which were selected to become 25 selected bibliographies, and 4 bibliographies were rejected because they did not meet the predetermined criteria. Table 1 presents the number of bibliographies from each year produced in searches via PoP software.

Table 1. Bibliography Search Results 2014 - 2023

Year	Accepted	Rejected	Total
2014	1	1	2
2015	1	0	1
2016	0	0	0
2017	1	1	2
2018	1	0	1
2019	3	0	3
2020	4	0	4
2021	3	1	4
2022	6	0	6
2023	5	1	6
Total	25	4	29

Bibliography Refinements and Equipment

To carry out bibliographic analysis, a filtering stage is required by checking and completing the metadata. The metadata examination includes the aspects analyzed, namely article title, author's name, affiliation or institution, country, abstract, keywords, article link, publisher, and year of publication. If the metadata is complete, the next stage is bibliometric analysis.

Bibliometric analysis can be carried out based on seven aspects, including: (1) the development of publications; (2) journals that contain

the most articles about Fundamental Movement Skills, Fundamental Motor Skills, Elementary School, and Primary School; (3) articles that are most cited; and (4) keywords most often used by authors in Fundamental Movement Skills, Fundamental Motor Skills, Elementary School, and Primary School. (5) collaboration between institutions or affiliates; (6) institutional collaboration; and (7) distribution of authors from various regions. VOSviewer software is software used for bibliometric analysis, so the results of bibliometric analysis will be visualized by this software (Martínez-López et al., 2020; Shukla et al., 2020). VOSviewer works by detecting a large number of words and offering a variety of visuals or displays, analyzing different observations (Julia, Dolifah, et al., 2020; Rafols et al., 2012; Van Eck & Waltman, 2010, 2014). Correspondingly, VOSviewer can create maps of publications, authors, or journals based on co-citation platforms or key maps centered on distributed channels (Hudha et al., 2020; Julia, Dolifah, et al., 2020). The types of files imported into VOSviewer for analysis are files from EndNote X

RESULTS AND DISCUSSION

Analysis of Publication Development

Figure 1 shows that there were 25 articles published on fundamental movement skills in elementary schools from 2014 to 2023. The development of publications shows a fluctuating pattern. An upward pattern occurred in 2016-2017, 2019-2020, and 2021-2022. The decreasing pattern occurred in 2015-2016, 2020-2021, and 2022-2023. Meanwhile, the persistent pattern occurred in 2014-2015 and 2017-2018. If we look at the period 2014-2023, the highest number of publications on fundamental movement skills in elementary schools occurred in 2022 with 6 articles. Meanwhile, 2016 was a year of concern because there were no articles examining fundamental movement skills in elementary schools.

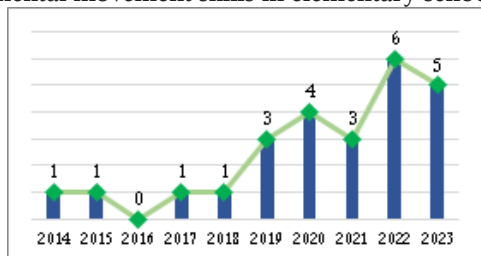


Figure 1. Publication Trend

Citation Development Analysis

Figure 2 shows that the number of citations to articles on fundamental movement skills

in elementary schools from 2014-2023 was 249 citations. The quote pattern also shows a volatile pattern with a five-time rising pattern and a five-fold falling pattern. An upward pattern occurred in 2016-2017, 2017-2018, 2018-2019, 2020-2021. Meanwhile, the decreasing pattern occurred in 2014-2015, 2015-2016, 2019-2020, 2021-2022, 2022-2023. If we look at the years 2014-2023, the highest citations occurred in 2014 with 72 citations, even though it was only from one article.

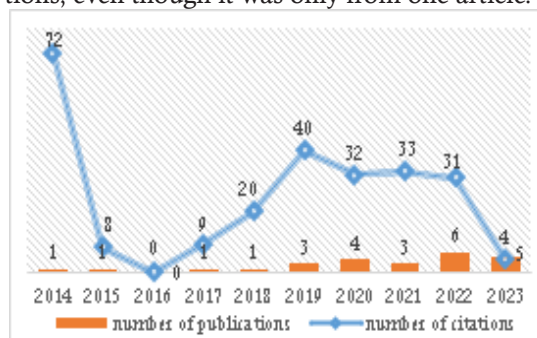


Figure 2. Citation Trend

Author Collaboration Analysis

A total of 113 authors were identified through the VOSviewer application, which was then analyzed with a minimum of authors having two documents. The results of the analysis show that there were seven authors in one cluster who collaborated with each other on the same article. Figure 3 and Table 2 present collaboration between authors on articles on fundamental movement skills in elementary schools.



Figure 3. Author Collaboration Network Visualization

Table 2. Number of Author Collaboration Links

Author	Documents	Total Link Strength
Bolger, linda a.	2	12
Bolger, lisa e.	2	12
Burns, con	2	12
Coughlan, Edward	2	12
Lacey, sean	2	12
O'brien, wesley	2	12
O'niel, cian	2	12

Author Keyword Analysis

69 author keyword terms were analyzed, with at least one occurrence of the same term. The results of the analysis produced 63 keyword terms with strong links. **Table 3** shows the author’s keyword grouping based on clusters, and Figure 6 shows the keywords in network visualization.

Table 3. Author Keyword Clustering

Cluster	Color	Number of Items	Author Keywords
1	Red	8	children; functional motor skills; nature; nature; playground; school; skill mastery
2	Dark Green	7	blended learning; cardiovascular fitness; elementary school; gross motor skills; learning media; manipulative play; movement skills
3	Dark Blue	7	early childhood; motor development; motor learning; motor skills; pediatrics; spectrum of teaching styles; teachers
4	Yellow	7	child helath; fundamental motor skills; motor competence; participation; proficiency barrier; tgmd-3; traditional games
5	Purple	6	attention; boys; cognitive function; discriminant analysis; fundamental movement skills; reaction time
6	Light Blue	6	Assesment; behavior change; real time; run; throw; video
7	Orange	5	competency; girls; mastery; object-control; test of gross motor development
8	Chocolate	5	movement; movement screening; physical literacy; skill development; youth
9	Pink	5	Exergame; experimental; physical activity; primary school children; transition

10	Black	4	athletics training; gender-related differences; movement development; physical education
11	Light Green	3	galah asin game; parental support; skills

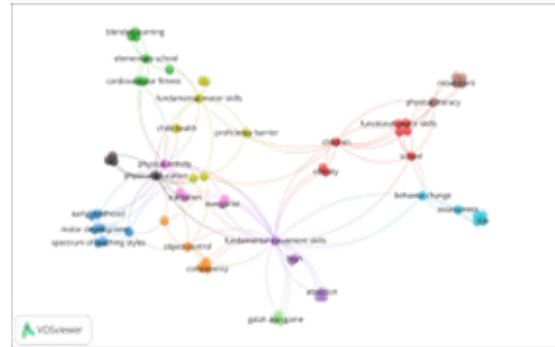


Figure 4. Author Keyword Network Visualization

Abstract Term Analysis

A total of 796 abstract terms were identified through the VOSviewer application, which were then analyzed using the minimum criteria of six terms appearing in 25 articles. The analysis results show that 36 terms have strong links. Figure 7 shows a visualization of the network of abstract terms in articles on fundamental motor skills in elementary schools.



Figure 5. Abstract Term Network Visualization

Institutional Collaboration Analysis

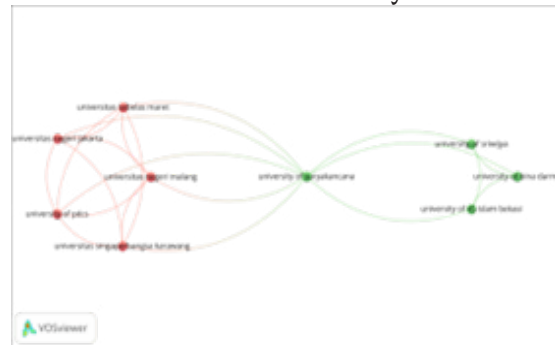


Figure 6. Visualization of Institutional Collaboration Networks

There are 39 institutions with 113 authors spread across the country. The results of the analysis show that nine institutions collaborate with each other and have strong links in publishing articles related to fundamental movement skills in elementary schools. Figure 8 shows collaboration between institutions.

Author’s Country Contribution Analysis

113 authors from 12 countries contributed to the article on fundamental movement skills in elementary schools. The three author countries that contributed the most to elementary school fundamental movement skills were Indonesia with 28 authors, followed by Ireland with 26 authors, and the United Kingdom with 17 authors. Table 4 shows the 12 countries that contributed to the publication of fundamental motor skills in elementary schools, and Figure 9 shows a visualization of the distribution of authors from various countries.

Table 4. 12 Countries Contributing to the publication Fundamental Movement Skills in Elementary Schools.

Country	Number of Authors
Indonesia	28
Ireland	26
United Kingdom	17
United State America	9
Australia	8
Netherlands	7
Canada	6
Ukraina	4
China	3
Slovakia	2
Thailand	2
Hungary	1
Total	113



Figure 7. Visualization of Author Distribution by City/Country.

Based on these seven findings, publications related to fundamental movement skills in elementary schools have begun to increase over the last ten years, although in 2023 there will only be five publications, a decrease compared to the previous year 2022, namely six publications. However, the number of publications in 2016 was a year where there was a lack of publications related to fundamental movement skills in elementary schools, even though the number of publications each year will have a significant impact on the development of publications and research topics.

Furthermore, the role of citations in publications is very important, because citations have become commonplace in evaluating scientific research, including individual publications, research groups, research institutions, countries, or journals (McManus et al., 2023; Waltman, 2016). The quotation pattern of fundamental movement skills in elementary schools shows a fluctuating pattern over the last 10 years. The most cited publication was in 2014, with 72 citations from one document written by Bryant et al. (2014) with the title “Fundamental movement skills and weight status in British primary school children.” Their research shows that weight status has been proven to have a negative impact on children’s competence in performing fundamental movement skills..

113 authors contributed to the publication of fundamental movement skills in elementary schools from 39 institutions spread across various countries. Author collaborations show that only seven authors with the strongest links collaborated on publications on fundamental movement skills in elementary schools. However, this collaboration was only established in one or two joint articles.

There are 63 keywords that have strong links to each other. Keyword analysis plays a very important role because this analysis plays an important role in the information search process (Muntashir & Erida, 2018). A visualization of keyword analysis shows that Fundamental Movement Skill has been linked to various keyword terms such as competency, object control, salty pole, and others.

Abstract analysis identified 796 terms used in fundamental movement skills publications in elementary schools. If analyzed using VOSviewer with a minimum number of occurrences of six terms, 36 terms are produced that have strong links to each other. The terms that appeared most often were fundamental movement skills with 78 events, child and study with 44 events, and were

followed by other terms that had strong links to abstract terms.

Likewise, institutional collaboration shows that of the 39 institutions involved in publishing fundamental movement skills in elementary schools, only nine institutions collaborate with each other in each publication. The institutions collaborating in the publication of fundamental movement skills in elementary schools are Sebelas Maret University, the State University of Malang, Sebelas Maret University, Singaperbangsa Karanwang University, the University of Pecs, the University of 45 Islam Bekasi, the University of Bina Darma, the University of Sriwijaya, and the University of Suryakencana.

All the institutions involved come from 12 countries. The countries that have contributed the most to publications on fundamental movement skills are Indonesia with 28 authors, Ireland with 26 authors, followed by other countries with less than 26 authors, including the United Kingdom, United States America, Australia, the Netherlands, Canada, Ukraine, China, Slovakia, Thailand, and Hungary.

CONCLUSION

Based on the seven questions asked, it can be answered and concluded as follows: (1) The trend of publication of fundamental movement skills in elementary schools shows a steady pattern, increasing and decreasing. The most publications will be in 2022, with six documents. (2) The citation trend forms an upward, downward, and persistent pattern. The highest citation occurred in 2014 with 72 citations. (3) Author collaboration in publications on fundamental movement skills in elementary schools does not show much collaboration, there is only one cluster with seven authors collaborating with each other. (4) Keyword analysis shows that only 63 keywords have strong links, such as Fundamental Movement Skill, which are linked to various keyword terms such as competency, object control, salty pole and others. (5) Abstract analysis shows 36 terms that have strong links to each other. The terms that appeared most often were fundamental movement skills with 78 events, child and study with 44 occurrences. (6) Institutional Collaboration shows that there are seven institutions that collaborate with each other in the publication of fundamental movement skills in elementary schools. (7) Distribution of countries that contributed the most to publications on fundamental movement skills, namely Indonesia with 28 authors and Ireland with 26 authors.

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