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# Recent trends in psychology in early life exercise and physical activity: A bibliometric study

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***Abstract***

**Introduction:** This paper aims to conduct a bibliometric analysis focusing on recent developments in psychology about physical activity and exercise during early life.

**Materials and Methods:** Excel, VOSviewer, and the bibliometric R-package tools were used to examine and assess pertinent records from the Web of Science (WOS) database between 2010 and 2023, following a dependable search approach.

**Results:** We obtained 31,618 scientific records from the Web of Science database. These records were retrieved using specific keywords and covered and analyzed for their content. The most popular topics in this research area included Children, Physical activity, Adolescents, Health, Quality of life, Exercise, Depression, and Stress. The research also revealed that the journals "Frontiers in Psychology" and "International Journal of Environmental Research and Public Health" were the most active in this field. Developed countries such as the United States, the United Kingdom, Canada, Australia, and the Netherlands were the most productive regarding research output. Additionally, the study identified Serge Brand as the most active author.

**Conclusion:** The intersection of early life psychology and physical activity and exercise remains an area of active research interest. This study indicates that researchers in developed countries produce the most literature on this topic. Nevertheless, it is important to acknowledge that a considerable portion of the global population, particularly in developing countries, needs to be adequately represented in the research on early life psychology related to exercise and physical activity.

**Keywords:** Bibliometrics, Children, Exercise, Physical activity, Psychology

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## Introduction

Physical activity has numerous health benefits that last a lifetime (1,2). For instance, research studies have shown that in adolescents, being physically active is linked with positive bone strength, cardio-respiratory fitness, blood pressure, lipid profile, and insulin sensitivity over time (3,4). Physical activity is important in preventing and treating obesity in children and adolescents (5). However, physical activity levels are particularly low in those with obesity, and increasing physical activity may have a greater impact on reducing body fat in those with higher body fat levels (6). Despite global

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recommendations that children should have at least 60 minutes of moderate to vigorous physical activity daily, many do not meet these guidelines (7-9).

Physical activity and exercise during early life are crucial in shaping physical and psychological well-being (10,11). The impact of engaging in regular physical activity during childhood and adolescence has been a subject of growing interest in the field of psychology (1,12). It contributes to physical fitness and overall health and has profound implications for cognitive development, emotional regulation, and social interactions (13). As researchers and practitioners continue to emphasize the significance of early life exercise, it is necessary to explore the recent trends in this domain to understand its evolving landscape better.

Given children's unique vulnerabilities to trauma, adverse events, and environmental risks, it is important to study the psychological effects of physical activity and exercise in this population (14). Some authors have suggested that a range of mental stressors, such as extended confinement, boredom, lack of information, and financial strain within families, can have significant and enduring effects on young individuals (15,16). Previous research indicates that living conditions, including limited personal space and poor housing conditions, can substantially impact the mental well-being of children and parents (17,18). For example, studies have found a correlation between living in apartments with restricted views and indoor quality and the presence of depressive symptoms (18). Additionally, the combination of psychosocial stress and lifestyle changes resulting from being confined at home can exacerbate the negative consequences on a child's physical and mental health, creating a harmful cycle (19). Unfortunately, despite its importance, this area has been neglected in the existing literature, with limited research on how young people react and respond during exercise and physical activity (14). This is unfortunate because understanding the behaviors and emotions of young individuals is essential for (a) effectively addressing their needs and (b) developing contextually relevant materials and preventive measures that can protect mental health while engaging in physical activity and exercise.

A bibliometric analysis offers a comprehensive and quantitative approach to assess the publication patterns, research themes, and the overall growth of a particular field (20). Understanding the recent trends in psychology related to early life exercise is paramount for several reasons. Firstly, it offers valuable insights into the scientific community's current interests and priorities concerning children's physical and psychological development. This understanding can guide policymakers, educators, and healthcare professionals in developing effective interventions and programs to promote healthy lifestyles among young individuals.

The second benefit of this is that it will assist researchers in pinpointing potential areas of study that need further investigation and research gaps. Scholars can also promote interdisciplinary collaboration and accelerate progress in the field by identifying influential works and collaboration networks and building upon existing knowledge (20).

Also, the findings of this paper can provide a basis for making decisions based on evidence in a range of areas, such as education, public health, and psychology. Recognizing the importance of physical activity in early life for promoting overall health (21), society can strive to create environments that promote physical activity and support the mental health of future generations (20).

This study aims to carry out a bibliometric analysis focusing on recent psychological developments about physical activity and exercise during early life. By examining the literature on early life exercise, this study seeks to provide important insights into the expanding body of knowledge, identify gaps in current research, and highlight prominent areas of study. Specifically, this analysis aims to investigate the growth of research publications on early life exercise and physical activity within psychology over a specific period. It also aims to identify the most productive authors, institutions, and countries that have contributed to this area of research.

Additionally, this study seeks to explore the distribution of research topics and themes, uncovering key areas of interest and potential interdisciplinary connections. Furthermore, it aims to analyze citation patterns and identify seminal works that have significantly influenced the field. Finally, this analysis aims to understand the collaboration networks among researchers and institutions in this domain.

## Materials and Methods

The research employed the bibliometric approach to examine and assess quantitative and qualitative articles in the relevant field. Bibliometrics involves statistical and mathematical methods to evaluate different aspects of the knowledge domain (22), and it encompasses quantitative techniques that enable the analysis of a vast amount of literature (23).

*Search strategy*

The increasing trend of scientific articles necessitates the selection of appropriate keywords and a specific search strategy that directly impacts the findings and results. To achieve this objective, the study considered three components. The search strategy for this study was based on three primary variables, namely "physical activity OR exercise," "early life," and "Psychology." To develop a reliable search strategy, synonyms of these variables were combined using Quotation marks, Boolean operators, and Truncation, as shown in Table 1. The search strategy was limited to the topic field (title, abstract, or keywords) between 2010 and the present. Additionally, this study included all languages and document types. All founded records were used for bibliometric analyses. The resulting publications were exported in "plain text" format, with the "full record and cited references" included.

**Table 1.** Search procedures and criteria

| Items | Description |
|---|---|
| Database | Web of Science |
| Keywords | "physical activity and exercise", "early life", and "Psychology" |
| Search fields | Topic (Title, Abstract, Keywords) |
| Search strategy | ("physical activit*" OR "physical inactivit*" OR "physical exertion" OR "exercise*" OR "aerobic exercise" OR “anaerobic exercise" OR "sport*" OR "fitness" OR "motor activity") AND (Psychology OR depression OR stress OR anxiety OR happiness OR mood OR “quality of life” OR “wellbeing” OR “well*being” OR “life satisfaction” OR “mental health”) AND ("Child" OR child* OR "Minors" OR "Puberty" OR "Pediatrics" OR pediatric* OR adolescen* OR preschool* OR "teenager" OR "teenagers" OR "teen" "boy" OR "boys" OR "school age" OR "teens" "girls" OR "boyhood" OR youth* OR "girlhood" OR "girl" OR "school-aged" OR "kid" OR "kids" OR underage* OR schoolchild* OR juvenile*) |
| Timespan | 2010 to 2023 |

*Data analyses*

On July 23rd, 2023, 31,618 scientific documents were exported from the WOS database in "plain text" format, covering the period from 2010 to 2023 and based on the selected keywords. The study employed descriptive analysis to identify the most influential authors, organizations, journals, and countries in the selected field. Furthermore, network analysis was conducted to evaluate the most effective patterns of co-citation, co-authorship, and co-occurrence author keywords.

Microsoft Excel version 2021 was used to draw different charts, while VOSviewer (version 1.6.18.0), developed by the Centre for Science and Technology Studies at Leiden University, was used to construct and display bibliometric networks among documents. Finally, the study installed R language (version 4.2.2) and its RStudio Macros on 64-bit Windows to conduct the appropriate network analysis, obtain structural information, and visualize the results. It employed the Bibliometrix R-package (version 4.0.0).

## Results

*Data characteristics*

The general information about the sources that were searched is presented in this section. These sources were published between 2010 and 2023. Between the years covered by the WOS database, 31,618 articles were published in the field, originating from 5,253 different sources. A total of 128,288 individuals authored these articles. The publication growth rate during this period was 6.14% annually, and the average age of the documents was 4.9 years. Additionally, there were a total of 954,025 references cited across all of the articles, and the authors used 47,237 keywords. The number of single-authored documents was 998, and the average number of co-authors per document was 7.75.

*Top ten relevant journals*

The top 10 journals in this field have been identified based on the number of articles they published during the period covered by the WOS database. "Frontiers in Psychology" tops the list with 949 articles, followed by the "International Journal of Environmental Research" with 882 articles, and "PLoS ONE" with 661 articles. The next seven journals on the list are "Psychology of Sport and Exercise" with 456 articles, "BMC Public Health" with 406 articles, "Scientific Reports" with 227 articles, "BMJ Open" with 224 articles, "Journal of Affective Disorders" with 208 articles, "Nutrients" with 166 articles, and "Journal of Applied Sport Psychology" with 154 articles.

*The most local citations*

According to the results, "PLoS ONE" received the highest local citations, with 15, 127 references. "Pediatrics" follows closely with 12,713 local citations, and "Medicine and Science in Sports and Exercise" is third with 12,096 local citations. The next seven journals on the list are "The Lancet" with 9,191 local citations, "BMC Public Health" with 7,818 local citations, "British Journal of Sports Medicine" with 7,642 local citations, "Proceedings of the National Academy of Sciences of the United States of America" with 7,419 local citations, "International Journal of Environmental Research and Public Health" with 7,281 local citations, "Psychology of Sport and Exercise" with 7,267 local citations, and "International Journal of Behavioral Nutrition and Physical Activity" with 6,881 local citations.

*The most relevant authors*

In this field, the top three authors with the most published articles during the period covered by the WOS database are Brand with 131 articles, Tiemeier with 95 articles, and Gerber with 92 articles. The next seven authors on the list are Fujiwara with 85 articles, Hofman with 84 articles, Holsboer-trachsler with 78 articles, Liu with 76 articles, Hashimoto with 75 articles, Tanaka with 70 articles, and Boomsma with 68 articles. Furthermore, Figure 1 shows the activity of these authors in the period from 2010 to 2023. The top three authors are still actively publishing articles in this field (Figure 1).

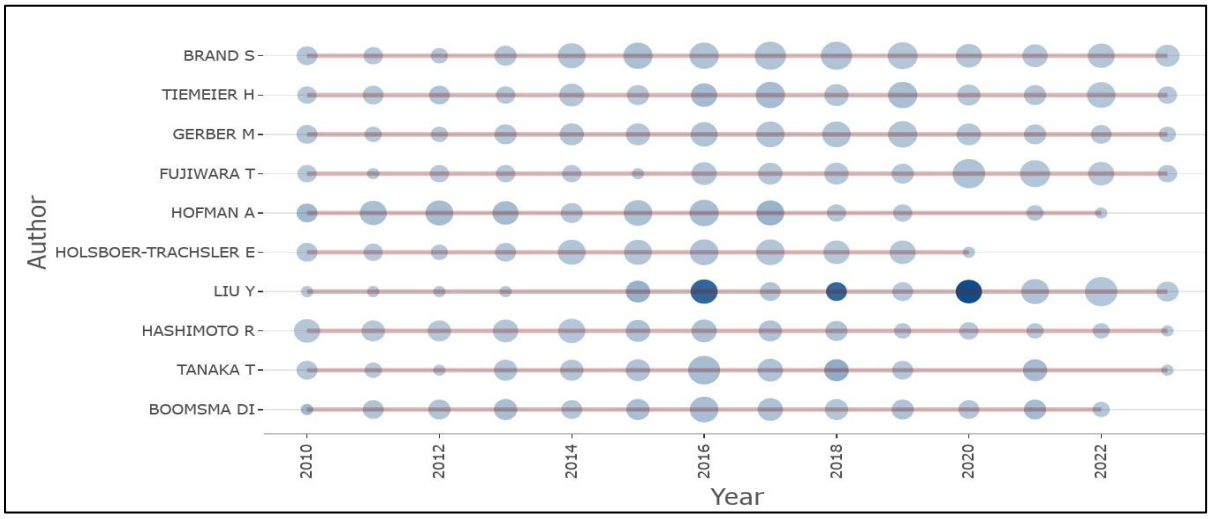


**Figure 1.** Authors' production overtime on the topic of psychology in early life exercise and physical activity

*Most relevant affiliations*

This section presents the number of published articles in this field for the top 10 universities and institutions during the period covered by the WOS database. Harvard University tops the list with 2,718 published articles, the University of London with 1,664 articles, and the University of California System with 1,438 articles. The next seven universities and institutions on the list are the University of Toronto with 1,419 articles, Erasmus MC with 1,159 articles, the Udice-French Research Universities with 1,129 articles, Erasmus University Rotterdam with 1,051 articles, Harvard Medical School with 946 articles, the University of Melbourne with 932 articles, and the University of Washington Seattle with 932 articles. Figure 2 indicates a steady increase in article publications in these universities since 2010 (Figure 2).

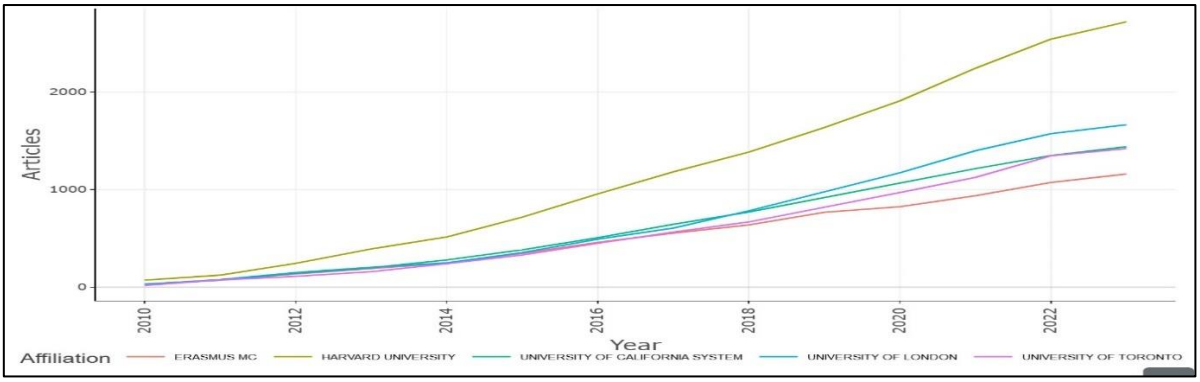


**Figure 2.** Affiliation production over time in the topic of psychology in early life exercise and physical activity

*Countries' Scientific Production*

In terms of countries producing articles in this field, the United States has the highest number of published articles, with 38,121 authors contributing to these articles. Next on the list is Japan, with 12,974 authors; England, 11,596 authors; and Australia, 11,219 authors. Canada, China, Germany, the Czech Republic, Spain, and the Netherlands follow, with 9,353, 8,375, 6,937, 6,744, 5,951, and 5,756 authors contributing to articles, respectively. Notably, there are no representatives from the African continent on this list (Figure 3).

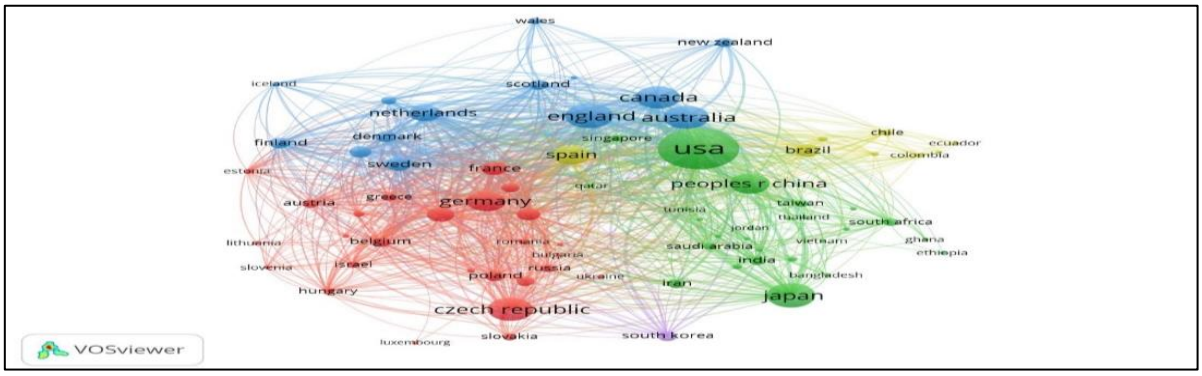


**Figure 3.** Network analyses of countries' Scientific Production on the topic of psychology in early life exercise and physical activity

*Keyword analysis*

The 4th figure displays the highest number of keywords used in these articles. The size of each box indicates the frequency of usage, and the percentage of each keyword usage in the total texts reviewed is shown in each box. In descending order, the most frequently used words in this field are Children, Physical activity, Adolescents, Health, Quality of life, Exercise, Depression, Stress, Prevalence, Risk, and Mental health. Figure 5 depicts a network analysis of the keywords used in these articles. This analysis showcases the simultaneous use of keywords in the articles. The more connection lines between two keywords, the more often they have been used together in the articles.

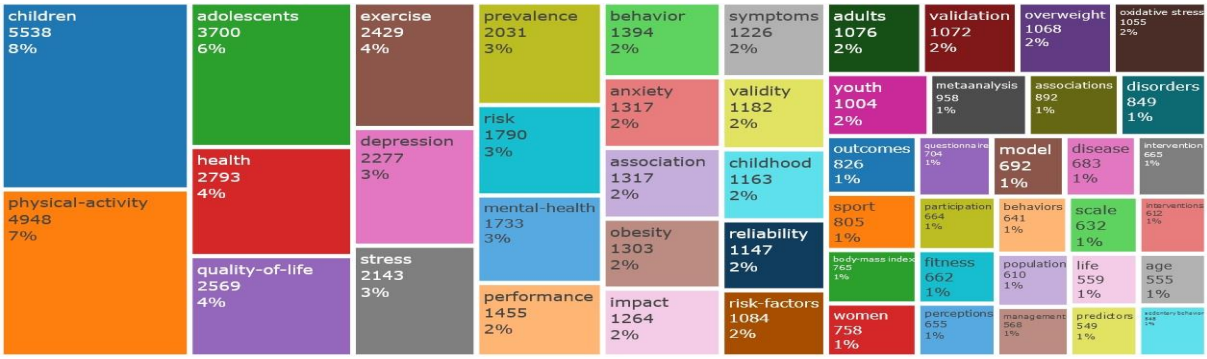


**Figure 4.** Tree map chart of author's keywords

*Network analyses*

Figure 6 depicts the collaboration of authors from various countries in producing these articles. This implies that it is an international subject area where scientists from different countries are interested in conducting joint research. For instance, the image illustrates a high level of collaboration between the USA, Japan, China, and Australia.

Figure 6 also highlights that different authors have collaborated in writing these articles. This could be attributed to this research topic's interdisciplinary and multidisciplinary nature. Figure 7 demonstrates that various universities have collaborated in producing these articles. The collaboration network is notably evident in the top ten universities in this field.

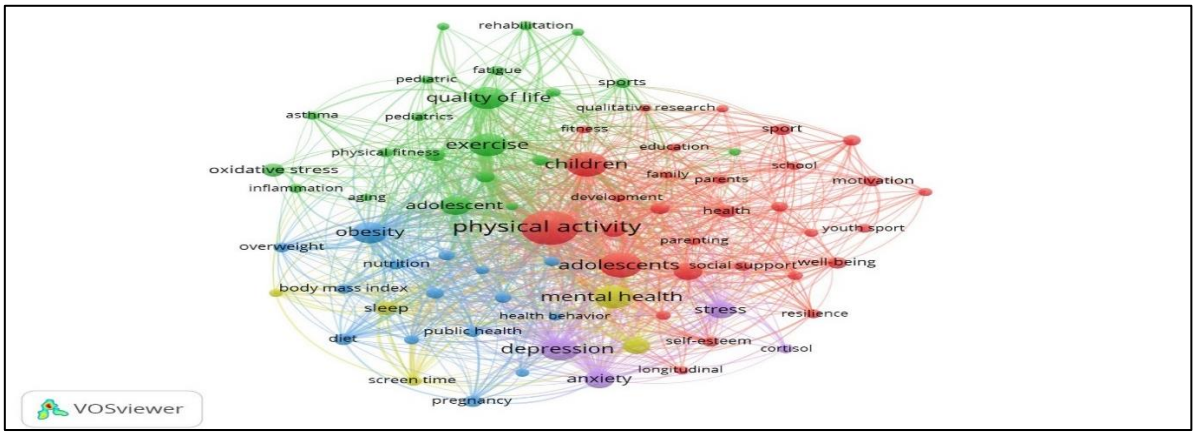


**Figure 5.** Network mapping of author's keywords

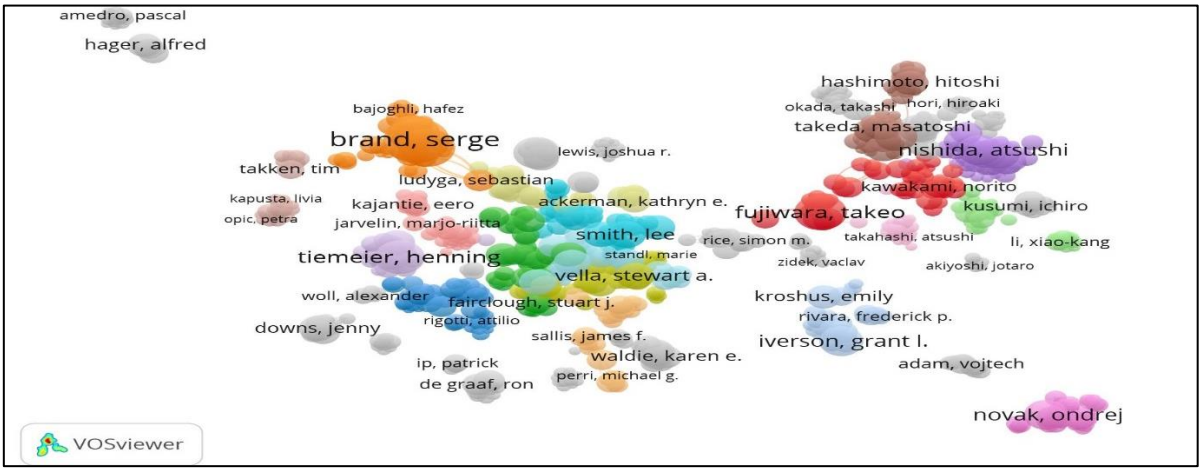


**Figure 6.** Network analyses of authors on the topic of psychology in early life exercise and physical activity

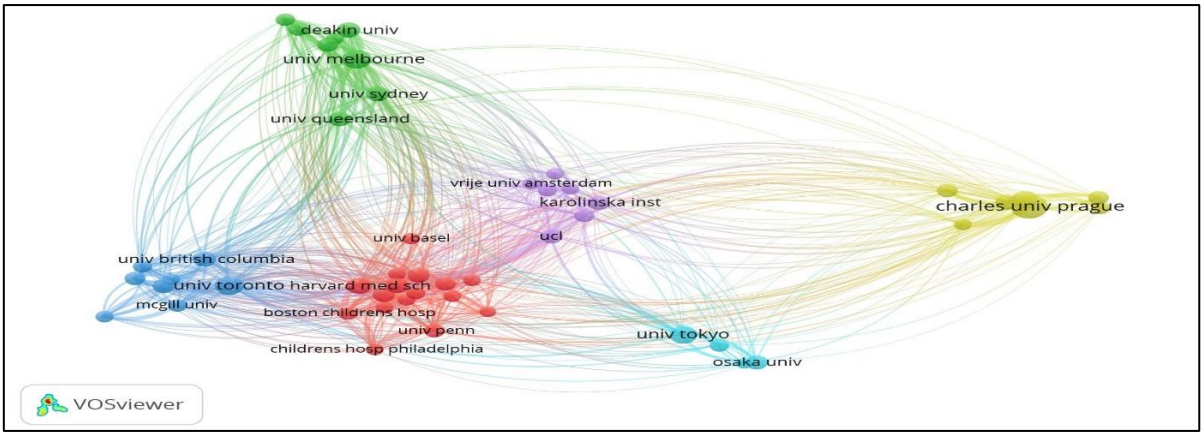


**Figure 7.** Network analyses of Universities on the topic of psychology in early life exercise and physical activity

## Discussion

In the present study, we conducted a bibliometric analysis to explore recent trends in the early life psychology of physical activity and exercise. The analysis utilized 31,618 scientific documents from the WOS database to comprehensively examine the intellectual landscape of this field. The findings of our study offer valuable and practical insights into the development of early life psychology about exercise and physical activity. The primary objective of this paper was to provide a comprehensive overview of the evolution of research in early life psychology and its connection to exercise and physical activity from 2010 to 2023. Many papers were identified throughout this period, indicating a growing interest among various journals and authors in this research area (24,25). Notably, the number of documents has shown an increasing trend over the years, possibly due to the inclusion of a wider range of journals in the field.

Since psychology and exercise or physical activity are interdisciplinary subjects (26,27), there has been a noticeable surge in researchers from diverse scientific backgrounds engaging in studies within this research domain. This trend highlights the attractiveness of this field for scholars from various disciplines who seek to explore its potential and contribute to its advancement. Moreover, the interdisciplinary nature of this area offers opportunities for fruitful collaborations both nationally and internationally.

Based on the data presented in this article, Serge Brand, affiliated with the University of Basel, Switzerland, emerges as the most prolific author in the selected research field. His work primarily explores the interconnections between fitness, exercise, physical activity, and various psychological aspects of human behavior.

Furthermore, "Frontiers in Psychology" and "International Journal of Environmental Research and Public Health" have significantly contributed to early life psychology concerning exercise and physical activity, with 949 and 882 papers, respectively.

The remarkable output from these highly active and productive journals has played a crucial role in advancing scientific research on the psychological aspects of exercise and physical activity in human early life. Their contributions have undoubtedly facilitated substantial scientific production in this particular study area.

The top ten productive organizations and institutions supporting research in the field of early life psychology related to exercise and physical activity are distributed across various developed countries, including the United States (four universities), Canada (one university), England (one university), France (one university), Australia (two universities), and the Netherlands (two organizations). Notably, the United States stands out as the country with the most productive organizations compared to other developed nations. Harvard University and the University of London emerged as the top two institutions globally.

However, it is essential to acknowledge that a significant portion of the world's population, particularly in developing countries (28), remains underrepresented in the research on early life psychology concerning exercise and physical activity. It is crucial to address this gap by fostering research efforts in developing countries, especially in Asia and Africa (29). By doing so, we can ensure a more comprehensive understanding of early life psychology and its relationship to exercise and physical activity, leading to more universally applicable diagnosis profiles and treatment outcomes.

The findings of this study underscore the need for further investigations that combine physical activity and cognition in developing countries (30). The limited research output and results from these regions can be attributed to inadequate research facilities, insufficient funding sources, and a need for more trained personnel (31,32). To bridge this gap and promote equitable research outcomes, it is imperative to strengthen research capabilities and support in developing countries, enabling them to contribute meaningfully to early life psychology concerning exercise and physical activity.

The keywords analysis presented a clear trend, where most theme-related terms were associated with physical activities, cognition, and mental health conditions. The study explored the intersection of early life psychology with exercise and physical activity. Key conceptual constructs included terms such as "Children," "Physical activity," "Adolescents," "Health," "Quality of life," "Exercise," "Depression," "Stress," "Prevalence," "Risk," and "Mental health."

This research is the first comprehensive bibliometric analysis to investigate studies

combining early life psychology with exercise and physical activity. By analyzing the productivity of scientific documents released in recent years, the study sheds light on the distribution of research contributions within this unique field. The findings offer valuable insights into the practical applications of such research and broaden the reader's perspective on the study's implications.

The study has some limitations that should be considered. Firstly, it focused solely on articles in the WOS database, which may only encompass some journals that have published research on early life psychology of physical activity and exercise (33). Additionally, there might be slight variations in the number of citations reported. Furthermore, one approach to increasing article citations is self-citation, where authors cite their previous work (34). It would be beneficial for future research to investigate the frequency of self-citation in the selected research area and its impact on the articles' visibility and influence.

Moreover, the concentration on journal articles led to the exclusion of other valuable scientific literature, such as books, conference papers, and textbook chapters. Future research should consider incorporating a broader range of academic sources for a more comprehensive understanding of the field.

The search and extraction of early life psychology of physical activity and exercise documents from the WOS database were limited to specific keywords, as described in the methods section. Given the vast scope of this research area, future researchers should employ a more diverse set of terms in their searches to capture a wider array of relevant publications.

## Conclusion

This study extensively examined and analyzed prominent authors, publishing journals, productive organizations, nations, and popular keywords in the combined early life psychology of physical activity and exercise research. The findings revealed a substantial and noteworthy expansion in such integrated research over the past decade. Notably, a considerable contribution to early life psychology of physical activity and exercise emerged from diverse authors, organizations, and journals in developed nations, including the United States, the United Kingdom, Canada, Australia, and the Netherlands. Identifying common themes in this field holds significant potential for influencing forthcoming interdisciplinary papers. Future research remains keenly interested in exploring the correlation between physical activity and cognitive function, as it continues to be an area of great interest and importance. The insights obtained from this study are expected to have a meaningful impact on advancing knowledge in this domain and stimulating further investigations.

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Not available

**Conflict of Interests**

There is no conflict of interest.

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**Ethical Considerations**

It is a review (bibliometric) study.

**Authors' Contributions**

Rahman Sheikhhoseini: The original idea, manuscript writing, protocol development, abstracted data, and manuscript preparation.

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