Bibliometric analysis of adaptive physical education in inclusive education to promote Sustainable Development Goals

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Abstract. Adaptive physical education (APE) is important to implement the inclusive schools. This research aims to map previous research regarding APE in inclusive education. This research was carried out using a bibliometric approach. This research procedure was carried out by collecting data, analyzing the limitations, and visualizing the data. Searching documents from the Scopus database with the keywords "adaptive physical education" and"inclusive education" obtained 41 documents. restricted "in English"; There are 28 documents publications on APE in inclusive education have increased periodically from 1995 to 2022. Disability and Rehabilitation is one of the journals that publishes many papers on APE in inclusive education. The United States is a productive country that has done a lot of research on this topic. Sowers et al., are the researchers who have published the most on this topic. In the last two years, APE in inclusive education has often been associated with adaptive equipment, special education, educational technology, assistive technology, teacher training, disabilities, pedagogy, teaching and learning, and Covid 19. These findings indicate that research on APE in inclusive education is still small but it is expected to increase in the coming years. In addition, a comprehensive study on this topic is hoped to encourage sustainable development goals (SDGs), especially area 4, ensuring quality education that is inclusive and equitable for all.

1 Introduction

All people have the right to experience and participate in educational activities, regardless of their cognitive level or physical ability [1 – 3]. Physical education and sports are useful for physically and socially rehabilitating people with disabilities [4, 5]. Adaptive physical education (APE) is an increasingly important area in the context of inclusive education.

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APE is a physical education program that is customized or modified depending on the students' condition [6 – 8]. APE provides the necessary solutions to ensure that children with special needs (CSN) can benefit the same from physical education as students who do not have special needs. APE is essential for promoting the growth and development of CSN [9], [10]. Adapted physical activity includes physical activity that has been adapted or modified to suit persons with disabilities [11 – 13].

Teachers do not yet understand APE learning for CSN, so teachers do not have the right strategies [14, 15]. Education for CSN in Indonesia is not yet optimal. Still separating CSN from normal children. Physical education teachers face challenges when implementing APE program practices for CSN [16]. Inclusive education is a hot topic in physical education. Research on how APE is implemented effectively in the context of inclusive schools is still lacking ([10, 17]. APE research findings have often been linked to special education topics, adaptive sports, exercise, and clinical articles in the last two years [18]. This shows that research on APE is still limited and is expected to continue to grow in the coming years.

Therefore, writing a review article on the bibliometric analysis of APE in inclusive education (APE-IE) is very important. This article can contribute significantly to understand research progress and provide directions for future research in this area. It also encourages the achievement of sustainable development goals (SDGs), especially in the field of quality education for all. This research uses bibliometric analysis to examine studies on APE-IE. This research aims to map previous research regarding APE-IE. This study has several research questions: 1) How many publications about APE-IE are published annually? 2) What are the top 10 sources that publish extensively on this topic? 3) What are the top 10 countries that have done a lot of research on this topic? 4) Who are the ten most influential authors on this topic? 5) What are the results of the co-occurrence analysis visualization on this topic?

2 Methods

Bibliometric analysis is employed in this study [18, 19]. Figure 1 details the bibliometric phases of the analysis carried out.

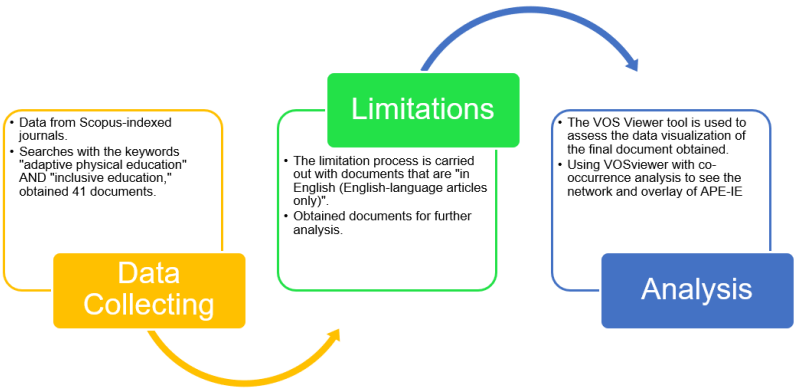

Fig. 1. Stages of Bibliometric Analysis of APE

3 Result and Discussion

The number of publications as per year is shown in Figure 2.

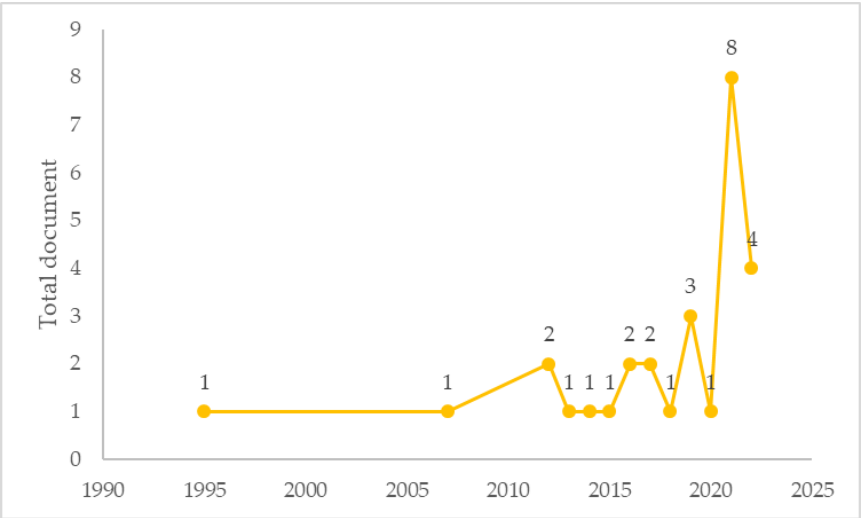

Fig. 2. Numbers of papers each year on APE-IE

In Figure 2, it is found that research on APE-IE began in 1995. The researcher that year [20], examined fostering the independence and engagement of students with significant physical disabilities in carrying out community activities. Research on barriers and physical activity among children and adolescents with mental disorders increased significantly between 2020 and 2021 [21]. Implementing assistive technology in inclusive schools [22]. Fundamentals of inclusive training and education organization for disabled karate athletes [23]. This increase in the number of publications is in line with research on technology-supported special education, which has also increased [24]. The top ten journals that have published the most articles on APE-IE are mentioned in Table 1.

Table 1. Top 10 journals for APE-IE

Source Title	Total	Q	SJR	Percentile
Disability and Rehabilitation	2	Q1	0.796	85%
Frontiers In Psychology	2	Q1	0.800	78%
Teoriya I Praktika Fizicheskoy Kultury	2	Q4	0.192	7%
Advances in Child Development and Behavior	1	Q1	0.999	75%
Cypriot Journal of Educational Sciences	1	Q3	0.220	36%
Disability and Rehabilitation Assistive Technology	1	Q1	0.690	97%
Gastroenterology Nursing	1	Q3	0.215	37%
Health And Social Care in the Community	1	Q1	0.830	87%
International Journal of Educational Research Open	1	Q1	1.012	95%
International Journal of Hygiene and Environmental Health	1	Q1	1.211	95%

Table 1 shows that articles about APE-IE are mostly published in Scopus indexed journals (Quartile-1). In addition, the publishers are dominated by Elsevier and Taylor & Francis. Ten productive nations write extensively on APE-IE, as shown in Figure 3.

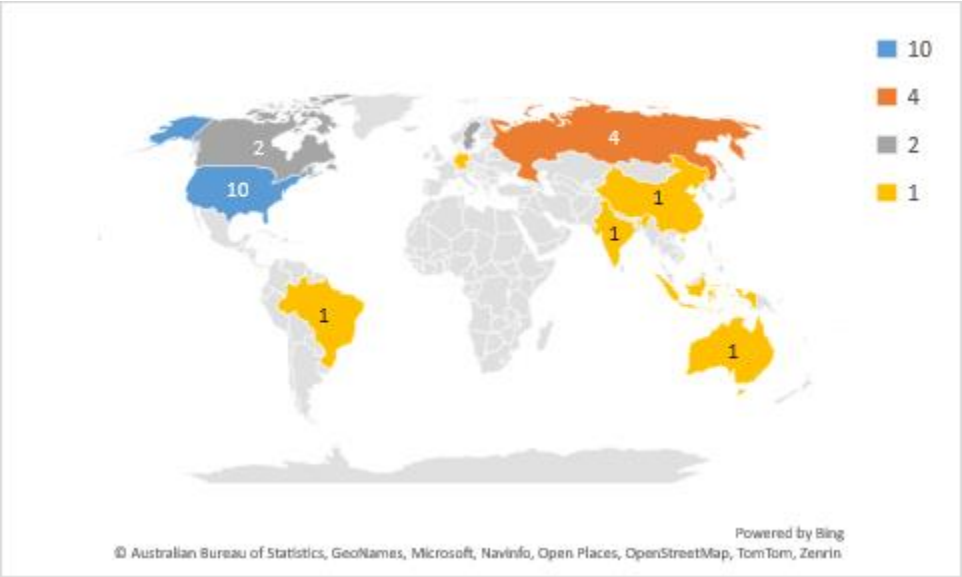

Fig. 3. Ten highly productive nations have published a lot on APE-IE

In Figure 3, it is found that the ten countries that have published the most articles on this topic are the United States with ten articles, the Russian Federation with four articles, Canada and Sweden with two articles each, and Australia, China, Germany, India, and Indonesia each with one article. The researchers from the U.S. include [21, 22, 25, 26]. The US is the most productive country on this topic is in line with the number of authors from this country who are influential authors based on the number of citations. Most of the authors in Table 2 are from the US.

Influential authors in APE-IE based on total citations are presented in Table 2.

Table 2. Influential authors in the field of APE-IE

Fundings	Authors & Years	Source/ SJR/Quartile	Cited
A multi-element approach can be used as a solution to equip students with inclusive education, community skills, and activity teaching.	Sowers & Powers, (1995) [20]	Mental Retardation/-	47
Several factors contribute to victimization causing academic disparities, considering their impact on individual learning processes (motivation, concentration, self-efficacy, etc.) as well as deeper psychological and social processes.	Poteat et al., (2014) [27]	Advances in Child Development and Behavior/0.999/Q1	41
Involvement in adapted inclusive adventure and sport training courses stimulates a balance of present- and future-oriented psychosocial outcomes.	Carless et al., (2013) [25]	Disability and Rehabilitation /0.796/Q1	36
Preventive policies and regulations need to be implemented to eliminate weight-related teasing and create an inclusive physical education environment.	Li & Rukavina, (2012) [26]	Research Quarterly for Exercise and Sport/0.748/Q1	25
Increasing precision and clarity in naming terminology for certain services will also hopefully advance future scientific development and reliable measurement of effectiveness.	Wood et al., (2021) [28]	Journal of Alternative and Complementary Medicine/0.498/-	23

Fundings	Authors & Years	Source/ SJR/Quartile	Cited
The cultural context and situation regarding water, sanitation and hygiene among Roma communities is challenging and complex. Future research to address barriers to improvement must be inclusive and involve community members.	Anthoni et al., (2020) [29]	International Journal of Hygiene and Environmental Health/1.211/Q1	23
This framework represents a promising approach to advancing the debate regarding the psychological basis of anthropomorphism and better supporting the organization and clarification of teleology and anthropomorphism in biology.	Varella (2018) [30]	Frontiers in Psychology /0.800/Q1	20
Women's perceptions of good quality of life can be divided into five categories: (a) physical and mental health, (b) social well-being, (c) well-being, (d) strength and energy, and (e) personal well-being.	Bengtsson et al., (2007) [31]	Gastroenterology Nursing/0.215/Q3	18
There is a need for a policy on standardized online education platforms and provision of appropriate resources for virtual classroom sessions for marginalized families to minimize the digital divide in India.	Khanna & Kareem (2021) [32]	International Journal of Educational Research Open/1.012/Q1	12
To examine barriers and enabling factors to general psychiatric diagnoses and engagement of the general psychiatric population in physical activity, physical education, exercise, or exercise interventions.	Hickingbotham et al., (2021) [21]	Translational Behavioral Medicine/1.217/Q1	5

Figures 4 and 5 exhibit the outcomes of the network and overlay on APE-IE.

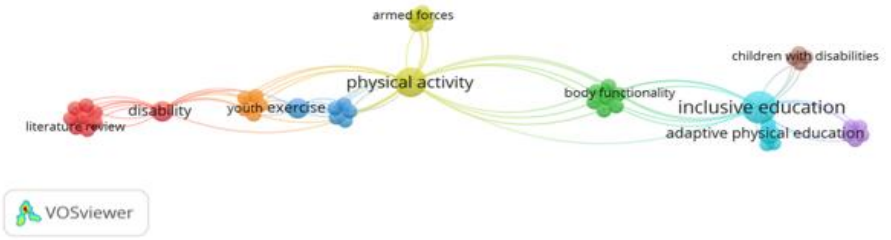

Fig. 4. Network visualization for APE-IE

Figure 4 shows eight clusters characterized by red, green, blue, yellow, purple, light blue, orange, and brown. In Table 3, each cluster displays the APE-IE article counts.

Table 3. The research progress for each cluster

Cluster	Number of Keywords	Keywords
Red	9	disability, special education, teacher training, classroom technology, education technology, assistive technology, adaptive equipment, adaptive device, literature review
Green	7	adaptive potential, body functionality, elementary school, health, maladaptation, speech disorders, stress
Blue	6	Aging, community group, community health, community-based exercise program, evaluation, exercise
Yellow	6	armed forces, mental health, narrative, physical activity, recovery, soldiers
Purple	5	covid-19, India, online teaching, pedagogies, teaching, and learning

Cluster	Number of Keywords	Keywords
Light Blue	5	adaptive physical education, children with health issues, inclusive education, inclusive education environment, students with special educational needs
Orange	5	Autism, mental illness, psychiatric, systematic scoping review, youth
Brown	4	children with disabilities, marginalized, out of school, unreached

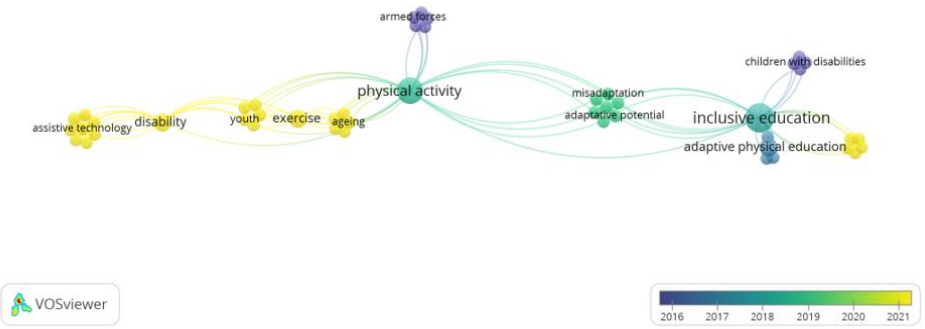

Fig. 5. Overlay visualization for APE-IE

Figure 5 shows that research on APE-IE in the last two years are related to adaptive equipment, special education, education technology, assistive technology, adaptive devices, teacher training, disability, youth, exercise, pedagogies, teaching, and learning. Inclusive education prioritizes the human rights of CSN, which shows its importance. It is an option to provide education for CSN in response to the demands for "education for all." Inclusive education accesses the possibility of teaching students with disabilities of various severity in primary general education conditions outside of correctional courses [33 – 35]. Workable techniques and methods must be created to address the obstacles to inclusion that kids and teenagers with impairments confront [20, 21, 36, 37].

The Ministry of Education and Culture launched the Inclusive School program to give CSN who don't attend special schools access to education. Inclusive public schools, sometimes known as non-special schools, also serve CSN [38 – 40]. Inclusive schools work together will organize and integrate regular and special education students into the same program. The existence of inclusive schools can provide equal opportunities for CSN to obtain educational services without discrimination [41– 43].

In inclusive schools, some students have various obstacles in sight, hearing, motor, emotion, behaviour, etc. APE learning has carried out strategies in the form of modifications, for example, in terms of language, concepts, and the availability of study time [44 – 46]. CSN are meant to include deaf children who experience hearing impairments. These blind children experience visual impairments, mentally disabled children experience intelligence barriers, disabled children experience motor impairments, and autistic children experience communication, behaviour, and social interaction barriers [47]. Kirk et al. [48] believe that an exceptional child differs from average or typical children in terms of mental traits, sensory ability, communication skills, social behaviour, and physical attributes.

Inclusive schools provide services to students with disabilities placed in the same place as normal children. Every inclusive school conduct APE learning by modifying the way of learning for children with special needs to be carried out correctly. APE is a process of educating through movement activities for the rate of growth and development both physically and psychologically to optimize all potential abilities, physical skills adapted to

the abilities and limitations of the child, intelligence, physical, social, cultural, emotional, and sense of beauty. To achieve educational goals, namely the formation of a complete human being [49]. APE is a learning program designed to meet the psychomotor needs of children in such a way that it is unique to the child [50].

The APE process can be directed with the aim of (1) correcting posture, physical limitations, mobility, posture, and body mechanics; (2) providing opportunities to participate in physical activities safely and enjoyably; (3) instilling positive values and attitudes of all normal students towards the limitations of disabled students in order to respect each other [51, 52]; (4) developing movement skills, and sports achievement potential of children with disabilities, and (5) providing coaching for achievers to take part in various levels of "Paralympic Sports" competitions. In their implementation, APE programs are guided by the curriculum and look at students' conditions, needs, and abilities [53]. APE is the same as ordinary physical education, but in its implementation for CSN modifications, APE learning strategies are applied with three techniques: learning modification techniques, the environment, and learning activities.

The APE learning strategies can be applied by (a) Sports must be adapted to make it easier for CSN to participate actively in sports learning and training in schools; (b) Provision of programs and services for CSN that are comprehensive and designed to know, find, and solve problems in the psychomotor realm; (c) The design is designed to motivate, try, improve, rehabilitate life, and develop the achievement ability of CSN; (d) Flexible modifications and adjustments; (e) There is regular recording, which is more specific to each need; (f) The progress of learning outcomes seen from the initial ability; (g) Accommodating people with disabilities who have the potential to continue to be fostered, developed, and trained to excel and compete at various levels.

The increasing number of students with disabilities participating in general education has led to an increased demand for assistive technology programs that cater to their specific needs in inclusive environments [22]. CSN will benefit from using assistive technology. It can energize and support them in physical activity [17, 54]. Good APE learning can create educational interactions between CSN and their environment.

APE-IE that is managed and implemented well will have an impact on sustainable development, including: (a) Increase Student Awareness and Ability, (b) Discovering the potential of CSN to become outstanding athletes, (c) Integrating Physical Education with the Curriculum, (d) Improve Digital Literacy, and (e)Develop Social Skills.

Thus, APE-IE will greatly contribute to sustainable development by increasing students' awareness and abilities and increasing the potential for CSN to achieve in sports, digital literacy, and social skills. This can support the transformation and progress of education in SDG 4, namely prioritizing quality education that is inclusive and equitable for all [55, 56]. The results of this study are in line with recent findings that the profile of trends and citations of a study can contribute a further research and can also be used for strategic policy-making based on research data published in reputable publishers [57-63].

4 Conclusion

This results indicate that there are still little research on APE-IE, but this will increase over the next year. APE-IE publications have increased periodically from 1995 to 2022. Disability and Rehabilitation, Frontiers in Psychology, and Teo Riya I Paktika Tishchenko Kutluay publish many articles on APE-IE. The United States is a productive nation with many publications on APE-IE. Successful researchers who have published much on the subject include Sowers et al. Eight clusters on APE-IE were found using network analysis. In the past two years, APE-IE has frequently been linked through overlay visualization to adaptive technology, special education, educational technology, assistive technology, adaptive

devices, teacher training, youth, exercise, pedagogies, teaching, and learning. This results demonstrate that there are still little study on APE-IE, but it is anticipated to increase in the upcoming year. It is hoped that the findings on this topic can encourage the achievement of the SDGs, especially quality education for all.

Conflicts of interest

The authors declare no conflict of interest in this work.

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