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Review Article

The Impact of Adaptive Physical Education on the Physical and Cognitive Development of Children with Special Needs: A Literature Review

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Abstract

Objectives. This study aimed to conduct a literature review to examine the effects of adaptive physical education on the cognitive and physical development of children with special needs (CSN). Adaptive physical education enhances motor skills, physical health, and cognitive function in people with physical, sensory, or intellectual disabilities.

Materials and methods. A literature review is the research approach used, which looks at several pertinent empirical and theoretical studies conducted over the last five years, from 2019 to 2024, that provide guidance on the optimal method of educating students. The electronic searches have been performed using Scopus, Web of Science, Google Scholar, and PubMed. This review of the study investigates the ways in which physical education might enhance students' motor skills, physical fitness, and cognitive and emotional development. This study also emphasizes the difficulties in implementing Physical Education (PE) into practice, such as inadequate facilities and unsupportive attitudes toward the topic.

Results. The study's findings demonstrate that adaptive physical education helps children with special needs to improve their balance, muscular strength, motor coordination, and aerobic capacity. This program also improves cognitive skills, including social skills, working memory, and focus. This article also offers suggestions for educators and legislators to increase the efficacy of adaptive physical education (APE) in inclusive curriculum.

Conclusions. Adaptive physical education has been considered to be a successful strategy for promoting the cognitive and physical development of children with special needs. It is recommended that programs are implemented according to individual requirements in order to maximize the advantages.

Keywords: adaptive physical development, children with special needs, physical development, cognitive development, literature review.

Introduction

Children with special needs (CSN) benefit significantly from adaptive physical education (APE), which supports their cognitive and physical development. Due to their sensorimotor, neurological, or cerebral deficiencies, children with special needs often face challenges in their physical and cognitive activities (Sherrill, 2004). The purpose of the APE program is to enhance a person's physical, motor, and cognitive capacities by offering a movement experience that is suitable for their abilities (Hutzler & Sherrill, 2007). In addition to increasing physical fitness, APE enhances executive function, motor coordination, and social and emotional abilities via a methodical, needs-based approach (Willoughby & Hudson, 2023). The utilization of a digitally based physical education (PE) curriculum in primary schools is investigated in this research. Despite the fact that 74% of instructors perceive advantages, issues include a lack of training and insufficient infrastructure. For successful implementation and student growth, recommendations include enhancing infrastructure, educating educators, and guaranteeing fair access to technology (Indarto et al., 2024).

In terms of physiology, CSN's participation in organized exercise enhances muscular strength, cardiorespiratory

endurance, and flexibility all of which are critical for their everyday mobility and independence (Winnick & Porretta, 2016). According to this research, children with special needs benefit from typical sports treatment in terms of their motor abilities. To improve total physical fitness in children with exceptional needs, further study should take psychological and psychosocial elements into account (Nurhidayat et al., 2023). APE has been shown in several studies to enhance motor control, balance, and posture, particularly in children with developmental abnormalities, including autism spectrum disorder (ASD) and cerebral palsy (Westendorp et al., 2011). Furthermore, it has been shown that an exercise program based on modified High-Intensity Interval Training (HIIT) may improve aerobic capacity and lower the risk of obesity, which is common in this group (Pan et al., 2017). The goals of exercise programs are to enhance cognitive function, motor abilities, and physical fitness (Nugroho et al., 2024). According to research, both cardiovascular endurance and muscular strength are enhanced by resistance and aerobic exercise (Fachrezzy et al., 2023). Children with exceptional disabilities benefit significantly from game-based activities that improve their social skills and motor coordination (Dapp et al., 2021). Additionally, modified High-Intensity Interval Training (HIIT) lowers the risk of obesity and increases aerobic capacity in children with special needs (Westendorp et al., 2011). This research examines 15 publications on holistic education in physical education to improve whole-child development via efficient teaching techniques. It suggests a conceptual framework that integrates body, mind, and spirit (Syaukani et al., 2023). Strategic interventions are needed to promote sports participation and health education (Syaukani et al., 2024).

APE may enhance executive functions, such as working memory, attention, and problem-solving abilities, from a cognitive standpoint. According to a study by Gunzenhauser & Nückles (2021) physical exercise that requires strategy and coordination might enhance brain plasticity and neural connection, both of which support CSN's cognitive development. Participating in adaptively planned physical activities also enhances emotional control and self-regulation, which is crucial for children with developmental disorders like ASD and Attention Deficit Hyperactivity Disorder (ADHD) (Memari et al., 2013).

The absence of qualified teaching personnel, inadequate facilities, and instructors' ignorance of how to adapt activities to meet the unique requirements of CSN are just a few of the obstacles that currently hinder APE's adoption in the educational setting (Block & Obrusnikova, 2007). Thus, the purpose of this evaluation of the research is to thoroughly examine how APE affects CSN's physical and cognitive development and investigate implementation techniques that might increase the program's efficacy in the classroom.

Materials and methods

Search Profile and Database

The influence of adaptive physical education on the cognitive and physical development of children with special needs is examined in this research using a literature review methodology. To have a thorough grasp, this approach is utilized to locate, examine, and synthesize different scientific publications. Using keywords like "adaptive physical education," "physical development of children with special needs," and "cognitive development," literature searches were carried out using databases like Google Scholar, ScienceDirect, PubMed, and Web of Science. The search process was divided into four stages (Preferred Reporting Items for Systematic Reviews and Meta-Analyses): identification (finding 500 related articles from various sources), screening (removing 150 duplicates), eligibility (120 articles meeting the criteria after evaluation of research methodologies and results), and inclusion (only 30 articles that passed the final selection based on the PEDro scale, which is available for free online (https://www.pedro.org.au/english/downloads/pedro-scale/) and has been translated into seven languages in figure 1.

The PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) for meta-analysis, which encompasses the phases of Identification, Screening, Feasibility, and Inclusion (Page et al., 2021) (figure 1).

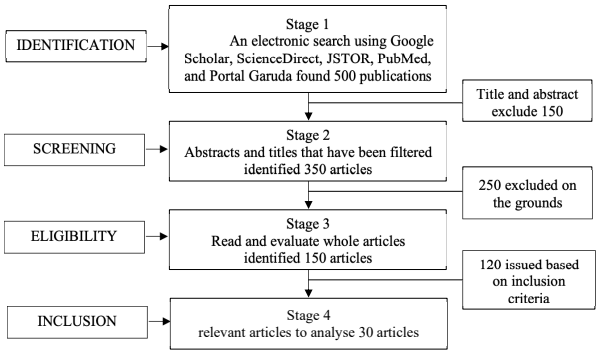

Fig. 1. Search procedure flow diagram

When conducting a literature review, inclusion and exclusion criteria are established to ensure that the literature is used for relevance in accordance with the research topic. Table 1 shows the inclusion and exclusivity criteria applied to research on the impact of adaptive physical education on the physical and cognitive development of children with special needs through a literature review. As illustrated in the flow chart (Figure 1), a total sample of 30 articles was obtained from a total of 500 articles that adhered to the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) (Page et al., 2021).

Methodological Evaluation of Quality

According to Moseley et al. (2020) articles with a score of 8–11 are considered high quality, a score of 4–7 is considered moderate, and a score below 4 is considered low. The methodology was evaluated using the 11 criteria of PEDro (Physiotherapy Evidence Database), which helps users overcome time constraints and critical thinking skills and facilitates the integration of research into clinical practice.

Procedure for Data Analysis

The following steps make up the systematic data analysis process in this literature review: First, the literature is found

Table 1. A comprehensive assessment of adaptive physical education on the cognitive and physical development of children with special needs inclusion and exclusion criteria

Classification	Criteria	
	Inclusion	Exclusive
Study Type	Studies that examine the effects of adapted physical education on the cognitive and/or physical development of children with special needs (CSN) by correlational, experimental, and quasi-experimental methods.	Descriptive research does not examine the link between CSN development and adaptive physical education.
Participants	Children aged 6 to 18 who participate in adaptive physical education programs have unique needs (such as autism, ADHD, blindness, hearing, or disability).	Studies that targeted the adult population (>18 years old) or included individuals without special needs
Intervention	Programs for adaptive physical education that are focused on systematic physical activity, such as those that include games, exercises, and motor training.	Studies that solely looked at physical therapy without a physical education component or that did not use adaptive physical education as the primary intervention.
Variables Examined	Cognitive (executive function, attention, memory) and/or physical (balance, coordination, strength, endurance) development	Research that excludes physical or cognitive development and only focuses on social-emotional or psychosocial factors
Type of Publication	Articles published in peer-reviewed international conference proceedings or scientific journals that are indexed by Scopus or Web of Science.	Viewpoints that are not supported by actual research, popular novels, technical reports, or non-peer-reviewed publications.
Language	Articles written in either Indonesian or English	Articles without official translations are written in languages other than English or Indonesian

and chosen using academic databases like Scopus, Web of Science, and Google Scholar with keywords related to adaptive physical education and the development of children with special needs; Second, screening is done based on the research method, relevance, and year of publication (last 5 years); Third, data synthesis employs qualitative meta-synthesis to find patterns of findings; Fourth, comparative analysis compares research results based on the type of disability and intervention method; and finally, the results are interpreted to highlight the theoretical and practical implications in adaptive physical education.

Limitations of the Research

The scope of the research includes adaptive physical education programs created for children with various types of disabilities, such as the visually impaired, deaf, visually impaired, and cerebral palsy, taking into account the factors of learning methods, exercise intensity, and pedagogical approaches. The limitations of this study are concentrated on analyzing the impact of adaptive physical education on the physical and cognitive development of children with special needs through a literature review.

Results

The Number of Results Examined

The following chart displays the total number of publications in the chosen period. The PEDro 11 scale was used to assess the quality of the analyzed articles. The literature review includes research on the impact of adaptive physical education on the cognitive and physical development of children with special needs (table 2). The literature searches are carried out electronically through Google Scholar, ScienceDirect, PubMed, and Web of Science using the PRISMA method.

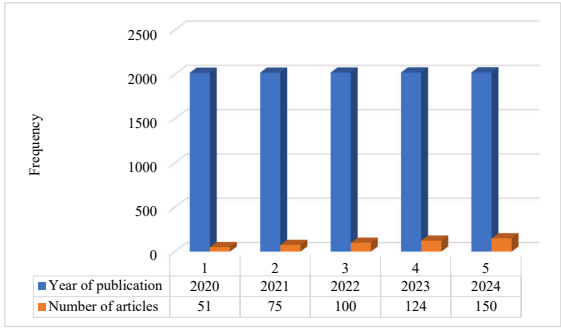

Fig. 2. Annual growth in the number of articles

Figure 2 shows the evolution of the number of publications over different periods. This includes a noticeable increase in scientific output from 2020 (51 articles), 2021 (75 articles), 2022 (100 articles), 2023 (124 articles), and 2024 (150 articles). The literature indicates that the thematic analysis that can be applied in physical education learning is shown in the figure above, which consists of thirty studies. Research on strategies to improve physical education learning improves students' health, physical activity, active lifestyle, and physical fitness.

Results of Exercise Significance

Regardless of gender, all 30 of the chosen and examined publications demonstrated noteworthy findings about the effects of adaptive physical education on the cognitive and physical development of children with special needs.

Table 2. PEDro scale for population and research design

N.	Study	PEDro scale											Total
		1	2	3	4	5	6	7	8	9	10	11	
1	(Du et al., 2024)	1	1	0	1	0	0	0	1	0	0	1	5
2	(Meijers et al., 2024)	1	1	0	1	0	0	0	1	0	1	1	6
3	(Miray Sümer Dodur & Çalişkan, 2024)	1	1	0	1	0	0	0	1	0	1	1	6
4	(Peltokorpi et al., 2024)	1	1	0	1	0	0	0	1	0	1	1	6
5	(Vargas et al., 2024)	1	1	0	1	0	0	0	1	0	1	1	6
6	(Stark et al., 2024)	1	1	0	1	0	0	0	1	0	1	1	6
7	(R. Yang et al., 2024)	1	0	0	1	0	0	0	1	0	1	1	5
8	(Then & Pohlmann-rother, 2023)	1	1	0	1	0	0	0	1	0	0	1	5
9	(Habbak & Khodeir, 2023)	1	1	0	1	0	0	0	1	0	1	0	5
10	(Labbe, Delphine et al., 2023)	1	0	0	1	0	0	0	1	0	1	1	5
11	(Haerens et al., 2023)	1	1	0	1	0	0	0	1	0	0	1	5
12	(Pushkarenko et al., 2023)	1	1	0	1	0	0	0	1	0	0	1	5
13	(Tarantino et al., 2022)	1	1	0	1	0	0	0	1	0	1	1	6
14	(Sonnenschein et al., 2022)	1	1	0	1	0	0	0	1	0	0	1	5
15	(Atkins et al., 2022)	1	1	0	1	0	0	0	1	0	1	1	6
16	(Schoop-kasteler, 2022)	1	1	0	1	0	0	0	1	0	1	1	6
17	(Oki et al., 2022)	1	1	0	1	0	0	0	1	0	1	1	6
18	(Health, 2022)	1	1	0	1	0	0	0	1	0	0	1	5
19	(Putten et al., 2022)	1	1	0	1	0	0	0	1	0	1	1	6
20	(Roorda et al., 2021)	1	1	0	1	0	0	0	1	0	1	1	6
21	(W. Yang et al., 2021)	1	1	0	1	0	0	0	1	0	1	1	6
22	(Kok et al., 2021)	1	1	0	1	0	0	0	1	0	1	1	6
23	(Guo et al., 2021)	1	1	0	1	0	0	0	1	0	1	1	6
24	(Chinwendu et al., 2021)	1	0	0	1	0	0	0	1	0	1	1	5
25	(Jebril & Chen, 2021)	1	1	0	1	0	0	0	1	0	0	1	5
26	(Müller et al., 2021)	1	1	0	1	0	0	0	1	0	1	0	5
27	(Francisco et al., 2020)	1	0	0	1	0	0	0	1	0	1	1	5
28	(Dhiman et al., 2020)	1	1	0	1	0	0	0	1	0	0	1	5
29	(Sheppard & Wieman, 2020)	1	1	0	1	0	0	0	1	0	0	1	5
30	(Siegel et al., 2020)	1	1	0	1	0	0	0	1	0	1	1	6

Note: (1) Eligibility criteria; (2) Random allocation; (3) Allocation concealment; (4) Baseline comparability; (5) Blind participants; (6) Blind assessor; (7) Blind Therapist; (9) Intention to treat analysis; (10) Between-group comparisons; and (11) Point measure variability are available at https://pedro.org.au/wp-content/uploads/PEDro_scale.pdf

The reviewed 30 studies highlight key aspects of adaptive physical education. The research findings from 30 articles highlight the significant impact of adaptive physical education on the physical and cognitive development of children with special needs. Various studies demonstrate that physically active learning (PAL) programs and structured motor activities enhance engagement, improve motor skills, and foster cognitive and social development. Several interventions, such as bodily-tactile approaches, multisensory environments, and classroom modifications, have been shown to facilitate better learning outcomes and emotional resilience in children with disabilities. Moreover,

Table 3. Features and findings of the literature review on the effects of adaptive physical education on the cognitive and physical development of children with special needs

Author, Year	Topic	Sample	Result
(Du et al., 2024)	The impact of cognitive reappraisal on emotion recognition in mothers of children with special needs.	Mothers of children with special needs and mothers of typically developing children	Mothers of children with special needs detect negative emotions quickly, with bias. Cognitive reappraisal improves surprise recognition and reduces anger bias
(Meijers et al., 2024)	Implementation of a Physically Active Learning (PAL) program in special-needs schools for children with learning disorders.	37 children from two special-needs schools	PAL had a 95%+ implementation rate, improved on-task behavior (79%+), and 43% moderate-to-vigorous PA. Motor skills and fitness correlated with engagement.
(Miray Sümer Dodur & Çalişkan, 2024)	This study examined the relationships between parent-to-parent support perception, quality of life, and parent–child relationships parents of children with special needs.	235 Turkish parents of children with special needs	Quality of life partially mediates relationships, and enhancing parent-to-parent support improves it, strengthening parent–child bonds
(Peltokorpi et al., 2024)	The study explores bodily-tactile early intervention effects on interactional reciprocity between sighted mothers and one-year-old children with visual impairment and additional disabilities (VIAD)	Three mother-child pairs participated in an eight-hour video-based multiple-case study	The intervention improved interactional reciprocity, as mothers used more bodily-tactile modalities and treated their children's movements as meaningful turns in interaction
(Vargas et al., 2024)	The study explores how reading frequency and medium affect text comprehension in primary students, including those with and without special education needs (SEN).	2,289 Spanish students (fourth to sixth grade), including 212 with SEN.	Leisure print reading positively impacts comprehension, while frequent academic digital reading negatively affects it, regardless of SEN status
(Stark et al., 2024)	Interdisciplinary collaboration between social-emotional learning (SEL) and special education research to enhance inclusion in schools.	Conceptual discussion, no empirical data	Inclusion needs proactive efforts, clear roles, universal benefits, and commitment. Interdisciplinary research helps overcome barriers and enhance inclusive policies.
(R. Yang et al., 2024)	Sedation considerations for people with special needs (PSN) in dentistry.	Review of various sedative agents and their implications for PSN.	Effective sedation requires assessing medical comorbidities, risks, benefits, and patient cooperativeness to determine appropriate agents and administration routes
(Then & Pohlmann-rother, 2023)	A systematic review of research on the transition to formal schooling for children with disabilities, based on ecological systems theory and an inclusive transition model.	55 studies using various methods, primarily interviews and questionnaires, focusing on parents, teachers, and service providers	Findings highlight shared perspectives on barriers and facilitators but reveal a lack of research on children's views, peer interactions, and broader social conditions
(Habbak & Khodeir, 2023)	Sensitivity of children with autism to interior space elements and their impact on skill development through multi-sensory rooms.	Children with autism in rehabilitation centers	Children with autism are most sensitive to light, which can be utilized in multi-sensory rooms to enhance their skills.
(Labbe, Delphine et al., 2023)	The study explores the experiences of individuals with disabilities in online adaptive leisure-time physical activity (LTPA) and its health impacts.	Semi-structured interviews with 10 participants and a survey of 104 individuals engaged in online adaptive LTPA	Online LTPA provides physical, emotional, and social benefits. Key factors include staff attitude, adaptability, and equipment access.

Table 3 (continued)

Author, Year	Topic	Sample	Result
(Haerens et al., 2023)	The study examines the combination of competence-supportive and controlling teaching styles in PE and their impact on students' motivation.	1,107 students participated	Competence support fostered positive motivation, while external and internal control led to negative outcomes. The "high competence-support, low control" profile was most adaptive, whereas "low competence-support, very high control" was most maladaptive
(Pushkarenko et al., 2023)	This study explores physical literacy (PL) from the experiential perspective of individuals with disabilities, emphasizing its role in fostering autonomy and belonging.	Thirteen individuals with disabilities participated in two focus groups, with data analyzed thematically.	Three themes emerged: (1) imagine the possibilities, (2) dance like nobody's watching, and (3) no wrong way to move. PL was valued for exploration, learning, and social interaction.
(Tarantino et al., 2022)	Teachers' attitudes toward including children with special educational needs and disabilities (SEND) in physical education.	Studies analyzed in a mixed-methods systematic review and meta-analysis	Teachers generally have favorable attitudes, influenced by experience, knowledge, preparation, years of teaching, type/degree of SEND, and support.
(Sonnenschein et al., 2022)	Parental views on distance learning for students with disabilities during COVID-19.	153 parents of PK-12 students receiving special education services	Limited special education, high reliance on adults for virtual learning, and parental difficulties balancing support with work and childcare
(Atkins et al., 2022)	Nursing students' engagement with children with special mental and physical disabilities.	28 undergraduate nursing students in a community-based respite care program	Benefits: cognitive growth, rewarding relationships, stress relief. Challenges: emotional discomfort, behavior management, expectations. Faculty support and community collaboration improve engagement
(Schoop-kasteler, 2022)	The study examines the sociometric status of students with intellectual disabilities (ID) in special needs schools and its relationship with social skills.	1,068 students with ID (M = 11.98 years, SD = 3.74; 31.5% female) assessed by school staff.	Many students were perceived as neglected. Accepted students had higher social skills, while rejected students had lower social skills than average students.
(Oki et al., 2022)	Floor projection feedback system for spatial–temporal cognition in adolescents with neurodevelopmental disorders (NDs) during physical activity.	Adolescents with NDs engaged in organized physical activities	The algorithm encouraged individuals to maintain close group proximity rather than equal spacing while walking, demonstrating its effectiveness in different organized physical activities.
(Health, 2022)	The disparity between under-5 mortality rates and the likelihood of disability before age five, highlighting inadequate disability funding.	Global data on child disability (377.2 per 1000 live births) vs. under-5 mortality (38.2 per 1000 live births) in 2019.	Disability funding declined by 11.4% (2007–2016), with only 2% of $79.1 billion allocated to disabilities. Urgent policy and funding reforms are needed to address inequalities by 2030.
(Putten et al., 2022)	Measurement and analysis challenges in studying young children with significant cognitive and motor developmental delays.	45 children (6 months–4 years) from Belgium and the Netherlands.	Research confirmed the complexity of disabilities, contextual challenges, and measurement difficulties, highlighting the need for creativity, perseverance, and modesty in generalizing findings
(Roorda et al., 2021)	Differences in student–teacher relationship quality and school engagement between boys in regular and special education for autism spectrum disorders (ASD).	182 boys from regular education and 113 boys from special education for ASD (grades 3–6).	Boys with ASD reported more conflict and lower engagement. Conflict had a stronger negative impact on engagement in special education

Table 3 (continued)

Author, Year	Topic	Sample	Result
(W. Yang et al., 2021)	The association between physical activity (PA) and mental health in children with special educational needs (SEN).	Systematic review of 18 studies (2010–2021) meeting inclusion criteria with quality ratings ≥ 60%.	PA improves psychological well-being, reduces anxiety and fatigue; unstructured PA has the strongest effects, while structured PA is most beneficial.
(Kok et al., 2021)	Effects of explicit vs. implicit instructions and feedback on motor learning and perceived competence in students with special educational needs.	9-to-13-year-old students practicing a balancing task in physical education	Performance and competence improved; verbal working memory influenced learning outcomes, but visuospatial memory did not. Instruction should align with verbal working memory capacity.
(Guo et al., 2021)	Examined early childhood special education (ECSE) teachers' self-efficacy in teaching children with and without disabilities and its impact on children's print knowledge.	73 ECSE teachers, 837 preschool children.	Teachers felt less self-efficacious with children with disabilities, especially autism. Higher self-efficacy predicted better print knowledge, but disability status did not moderate this relation
(Chinwendu et al., 2021)	The study assessed blended Rational Emotive Occupational Health Coaching (bREOHC) effectiveness in reducing occupational stress among teachers of children with special education needs.	A total of 83 teachers from inclusive and specialized schools in Abia State, Nigeria, participated in a group-randomized waitlist control trial	The bREOHC group showed significantly reduced stress levels post-intervention and at follow-up, with high participant satisfaction
(Jebril & Chen, 2021)	This study examines the architectural design of primary-school classrooms for intellectually disabled students, comparing them with classrooms for healthy students.	The research analyzes design specifications and environmental factors affecting students with intellectual disabilities	Five key architectural strategies are proposed, focusing on furniture, toilets, colors, materials, lighting, ventilation, and soft music.
(Müller et al., 2021)	Classroom peer effects on adaptive behaviors (conceptual, social, and practical skills) in students with intellectual disabilities (ID).	1125 students with ID (69% boys, mean age 11.30 years, SD = 3.75) in special needs schools.	Classroom peer effects were found for conceptual skills but not for social and practical skills
(Francisco et al., 2020)	The historical trajectory of special education, societal influences, and the effectiveness of inclusion.	A review of historical trends, special education laws, and key constructs	Inclusion challenges stem from unclear definitions, limited research, and awareness. Solutions include enhancing historical understanding, legal knowledge, and standardized implementation.
(Dhiman et al., 2020)	Mental health status and perceived strain among caregivers of children with special needs during COVID-19	264 caregivers completed an online survey	High depression (62.5%), anxiety (20.5%), and stress (36.4%) among caregivers. Increased strain and negative views on tele-rehabilitation worsened mental health.
(Sheppard & Wieman, 2020)	Alignment of special education and mathematics education in inclusive classrooms, focusing on teacher expertise in posing mathematical questions	Teacher educators from mathematics and special education	Significant differences in rankings of expertise, particularly in knowing individual students, teaching experience, students with disabilities, and mathematical content knowledge, highlighting collaboration challenges
(Siegel et al., 2020)	Intellectual disability (ID/IDD) as a psychiatric disorder and risk factor, DSM-5 updates, assessment, and treatment of co-occurring psychiatric disorders	Children and adolescents with ID/IDD	Effective diagnosis and treatment require modifications in techniques, understanding behavioral etiologies, and applying psychosocial and medical interventions

A thorough description of every PEDro Scala item may be found at https://pedro.org.au/english/resources/pedro-scale/ Microsoft Word - PEDro_scale.doc (accesed on December,27,2024). The highest possible score is 10

parental and teacher involvement plays a crucial role in fostering a supportive learning environment. Studies emphasize the importance of interdisciplinary collaboration in inclusive education, addressing barriers to learning, and optimizing assessment and treatment techniques for children with special needs.

Additionally, the findings suggest that structured physical activity benefits psychological well-being, reducing anxiety and fatigue while improving self-efficacy and adaptive behaviors. However, challenges persist, including limited research on student perspectives, disparities in funding for disability support, and the need for policy reforms to enhance inclusive education practices. Overall, the studies highlight the necessity of tailored educational and therapeutic approaches to maximize the potential of children with special needs.

Discussion

Several significant themes that highlighted the role of physical education in fostering an active and healthy lifestyle were found via a literature review using the PRISMA technique. The findings of the literature from the 30 publications examined highlight the following important points:

Enhancement of Motor Skills

According to the most recent research, adaptive physical education is a program that helps children with special needs develop their motor skills, including fine motor skills like grasping and gross motor skills like walking and jumping. It also helps children with special needs develop their balance, coordination, and muscle strength.

According to Chung et al. (2008) after 12 weeks of exercise, children with cerebral palsy who participated in adaptive physical education had improved balance and postural stability; Ryan et al. (2017) demonstrated that water therapy helped children with neurological disorders enhance their balance and coordination of movements significantly; and Goodway et al. (2019)) reported that a specially designed play-based program was able to improve body coordination and reflexes in autistic children, while Pan et al. (2017) demonstrated that games like gymnastics and jumping rope enhanced their motor skills and social interaction. Muthengi et al. (2024) The study found that cognitive academic engagement was positively related to school completion intention and was crucial for preventing school dropouts.

Additionally, Dapp et al. (2021) emphasize that structured physical activities, like balance and coordination exercises, have a positive effect on motor control in children with physical limitations. D. Lee et al. (2016) also found that proprioceptive exercise and walking therapy can help children with motor disabilities improve their confidence and movement control. Adaptive physical education, with the proper intervention, can help children with special needs improve their body's balance, coordination, and control, which supports their independence in day-to-day life.

Impacts on Fitness Level

Children with special needs frequently have limited physical activity, which contributes to low physical fitness and an increased risk of obesity and other health issues (Hutzler & Sherrill, 2007). As a result, programs that are tailored to the abilities of the children can have a substantial positive impact on their physical condition. Adaptive physical education programs are crucial in improving the cardiovascular endurance, muscle strength, and flexibility of children with special needs.

Güeita-Rodríguez et al. (2021) found that water-based therapy improved cardiovascular endurance, flexibility, and motor coordination in children with autism spectrum. Marzouki et al. (2022) found that an eight-week water-based exercise program improved aerobic capacity and muscle strength in children with autism. Activities like swimming and resistance training in the water help increase endurance without overloading the joints.

Additionally, Merino-Andrés et al. (2022) found that community-based strength training improved functional capacity and reduced fatigue in children with cerebral palsy. Abdullah and Putri (2025) found that the SETITI breathing exercise app for children with cerebral palsy is very accessible, easy to use, and motivates breathing exercises. It is advised to enhance the display choice with your favorite cartoons. Saadawi et al. (2025) also stated that community-based resilience training can improve the physical fitness of children with physical limitations.

Additionally, research by Ulrich et al. (2001) demonstrated that a 12-week treadmill-based exercise intervention significantly improved cardiovascular endurance and balance in children with Down syndrome, and Bahiraei et al. (2023) showed that children with Down syndrome who engage in adaptive aerobic exercise have an increase in cardiovascular endurance and flexibility. Activities like adaptive cycling, brisk walking, and specially designed games help increase a child's aerobic capacity without placing undue strain on the musculoskeletal system.

All things considered, adaptive physical education helps children with special needs become more physically active and lowers their risk of obesity and other health issues.

Improved Cognitive Function

Structured physical activity enhances blood flow and brain oxygenation, supporting a range of cognitive processes; physical activity-based interventions help improve attention, decision-making, and cognitive flexibility all of which are critical in both everyday life and educational settings; and adaptive physical education plays a significant role in improving the cognition of children with special needs, particularly concentration, executive function, and problem-solving.

Regular physical activity increases neuroplasticity, the brain's ability to form new connections, which supports children with attention deficit hyperactivity. Regular aerobic exercise also helps reduce impulsivity and improve academic focus. Ji et al. (2022) found that regular aerobic exercise had a significant impact on executive function in children with autism spectrum, including planning, self-control, and cognitive flexibility. The 12-week aerobics program improves task management skills, emotional control, and adapting to changing environments. Christiansen et al. (2019) found that children with ADHD increased working memory capacity and attention when they participated in adaptive exercise programs.

In addition, Northey et al. (2025) found that adaptive physical education enhances critical thinking abilities and information processing speed, while strategy-based and coordination exercises support analytical thinking and decision-making efficiency. Schmidt et al. (2018) found that complex motor exercises, including rhythmic gymnastics and coordination games, enhance the attention and memory capacity of children with dyslexia, while rhythmic and coordinated activity boosts cognitive nerve development.

Furthermore, exercise that gradually raises heart rate has a positive effect on neurotransmissions in the brain, which supports learning and cognitive development Liu et al. (2024) the moderate to high-intensity interval training program also improved memory function and thinking speed in children with special needs.

According to the study's overall findings, adaptive physical education improves the physical health of children with special needs and significantly improves their cognitive development. As a result, adaptive physical education programs should be planned methodically and consistently to maximize students' focus, executive function, and problem-solving abilities, which will ultimately improve their quality of life.

Psychosocial Effects

Adaptive physical education programs are crucial for improving the emotional well-being, social engagement, and self-confidence of children with special needs. These children frequently struggle with social interaction and experience higher levels of anxiety than other children. Using a specially designed approach, adaptive physical education provides an environment where children can improve their relationships with peers, develop social skills, and gain confidence.

K. Qi et al. (2024) added that interaction in these activities increases their comfort in the social environment, so their involvement in social activities outside of physical education sessions also increases. Lee and Vargo (2017) reported that children with autism who participated in group-based physical activity showed improved communication skills and social interaction. Physical activity in small groups helps them understand facial expressions and body language and respond better to communication.

Additionally, children who regularly participate in adaptive physical education have a more positive self-perception of their physical and social abilities. Goodwin and Watkinson (2000) stated that participation in adaptive physical education helps children feel welcome and increases social integration in school. An inclusive environment creates an enjoyable learning experience, promotes emotional well-being, and encourages participation in social and academic activities. Elshani et al. (2020) found that adaptive exercise helps reduce anxiety and increase the confidence of children with intellectual limitations.

Over the last ten years, research has shown that adaptive physical education helps children with special needs develop their character, confidence, and more positive social interactions in addition to their physical abilities.

The Role of Teachers and Learning Methods

Adaptive physical education ensures that all students can participate according to their abilities, so teachers must be competent in modifying teaching strategies to support students' motor, cognitive, and social development. The success of adaptive physical education depends on an inclusive approach, appropriate learning methods, and teachers' abilities to adapt materials for students with special needs.

Research shows that special training for teachers improves the effectiveness of adapting adaptive physical education curriculum. Haegele and Sutherland (2015) highlighted that teachers who are trained are better equipped to create inclusive physical activities and customize learning to make it more meaningful. Colquitt et al. (2017) also discovered that instructional differentiation improves the motivation and engagement of students with special needs.

Martin Ginis et al. (2021) found that environmental adaptation, such as visual aids and multimodal instruction, helped students with sensory and motor limitations be more active in learning. Qi and Ha (2012) stated that flexible methods that support different learning styles increase student motivation. The Universal Design for Learning (UDL) approach has been proven to be effective in increasing student participation in adaptive physical education.

Anagnostopoulou et al. (2021) demonstrated that augmented reality and sensory devices improved the attention, motivation, and motor coordination of students with developmental disorders. Sharon et al., (2022) discovered that virtual reality can help students with intellectual disabilities better understand instruction and develop motor skills. Technology plays a significant role in improving the effectiveness of learning.

Furthermore, community-based learning has been shown to be successful. Saadawi et al. (2025) showed that student confidence and independence were raised by community engagement, such as participation in inclusion programs or partnerships with specialist coaches.

Because adaptive physical education relies on community participation, technology, UDL implementation, and teacher training, policies that encourage teacher competency development and innovative teaching strategies are desperately required.

Conclusions

Physically structured programs enhance motor skills, balance, coordination, and physical fitness; customized physical activity boosts self-esteem and social engagement; and from a cognitive perspective, adaptive physical education enhances concentration, problem-solving, and executive function, supporting academic achievement. The program's success depends on inclusive methods, teacher skills, and a supportive environment, making it an ideal tool for the holistic development of children with special needs, according to a literature review.

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Conflict of interest

According to the authors, this research has no conflicts of interest.

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Вплив адаптивного фізичного виховання на фізичний та когнітивний розвиток дітей з особливими потребами: Огляд літератури

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 14 с., 3 табл., 1 рис., 75 джерел.

Мета дослідження. Мета цього дослідження полягала у проведенні огляду літератури щодо вивчення впливу адаптивного фізичного виховання на когнітивний та фізичний розвиток дітей з особливими потребами (ДОП). Адаптивне фізичне виховання сприяє покращенню рухових навичок, фізичного здоров'я та когнітивної функції у осіб з фізичними, сенсорними або інтелектуальними порушеннями.

Матеріали та методи. Огляд літератури є дослідницьким підходом, який застосовується для вивчення кількох відповідних емпіричних і теоретичних досліджень, проведених за останні п'ять років, з 2019 по 2024 роки, які надають рекомендації щодо визначення оптимального методу навчання студентів. Електронний пошук здійснювався із використанням наукометричних баз даних Scopus, Web of Science, Google Scholar та PubMed. Зазначений огляд дослідження вивчає способи, за допомогою яких заняття фізичним вихованням можуть поліпшити рухові навички, фізичну підготовленість, когнітивний та емоційний розвиток учнів. Дослідження також підкреслює труднощі щодо впровадження фізичного виховання (ФВ) у практичну діяльність, як-от недостатня матеріально-технічна база та несприятливе ставлення до цієї проблематики.

Результати. Результати дослідження демонструють, що адаптивне фізичне виховання сприяє покращенню рівноваги, м'язової сили, координації рухів та аеробної продуктивності у дітей з особливими потребами. Представлена програма також поліпшує когнітивні навички, включаючи соціальні навички, робочу пам'ять і концентрацію уваги. Дана стаття також містить пропозиції для освітян і законодавців щодо підвищення ефективності адаптивного фізичного виховання (АФВ) в рамках інклюзивної навчальної програми.

Висновки. Адаптивне фізичне виховання розглядається як ефективна стратегія, що сприяє когнітивному та фізичному розвитку дітей з особливими потребами. З метою максимізації переваг рекомендується впроваджувати програми відповідно до індивідуальних потреб.

Ключові слова: адаптивний фізичний розвиток, діти з особливими потребами, фізичний розвиток, когнітивний розвиток, огляд літератури.

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