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Article

Curricular adaptations in physical education: A global study on the inclusion of students with specific educational needs

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Abstract: In Ecuador, although regulations on curricular adaptations are clearly defined, Physical Education teachers face challenges at the micro-curricular level in adapting their classes to meet the needs of students with disabilities, specific learning difficulties, and vulnerable situations. The objective of this study was to analyze the presence and characteristics of specific curricular adaptations for Physical Education on a global scale. A scoping review was conducted following the PRISMA-ScR guidelines, covering studies from the Scopus database. A total of 112 articles were identified, and 16 that met the inclusion criteria were selected. These studies addressed curricular adaptations in Physical Education across five dimensions: teaching methodology, inclusive assessment, access to resources, accessible environments, and learning content, with a focus on students with disabilities. It was concluded that the combination of access adaptations, methodological strategies, and curricular content modifications enhances the inclusion and participation of students with disabilities. Interventions with these simultaneous adaptations achieved levels of satisfaction, self-efficacy, and holistic development, influenced by the geographical and cultural context.

Keywords: curricular adaptations; inclusive physical education; specific educational needs; adapted methodologies; educational equity

1. Introduction

Inclusive Physical Education poses a challenge for educational systems worldwide, particularly in curricular adaptation for students with disabilities, learning difficulties, and vulnerable situations (Díaz-Vásquez and Rosario-Rodríguez, 2023). Although curricular adaptation regulations are defined in many countries, such as Ecuador (Ministerio de Educación, 2024), implementation at the micro-curricular level faces challenges, especially in Physical Education classes (Aguilar Vargas et al., 2024). These challenges include a lack of adequate infrastructure, scarce adapted resources, and insufficient teacher training to carry out effective adaptations (Posso-Pacheco et al., 2024).

Curricular adaptations in Physical Education represent a fundamental component for ensuring the inclusion of students with disabilities, learning difficulties, and those in vulnerable situations. These adaptations are divided into six dimensions that comprehensively address the specific needs of these students. The type of curricular adaptation refers to adjustments in the curriculum, ranging from physical access modifications, such as ramp installation, to the redefinition of objectives and learning

outcomes within the national curriculum framework, aligned with the individual capacities of students (Barrera-Proaño et al., 2024).

Methodological strategies include differentiated pedagogical approaches, such as cooperative learning and multisensory teaching, designed to foster active participation in the learning process (Gobbi et al., 2024). The characteristics of inclusive assessment focus on adapting evaluation instruments and criteria to equitably measure individual progress, recognizing the specific abilities of each student (Quiguango Coral, 2024).

Adapted resources provide specific materials and tools, such as textured balls for students with visual impairments or simplified visual aids for those with learning difficulties (Díaz-Vásquez and Rosario-Rodríguez, 2023). The characteristics of the practice environment emphasize the need to adapt physical spaces to ensure accessibility, safety, and functionality, eliminating any barriers that may limit student participation (Barrett et al., 2019). Adapted learning content prioritizes the development of motor skills and inclusive values, such as collaboration and respect, tailored to the specific capacities and needs of students (Gobbi et al., 2024).

Despite regulations to promote inclusion in Physical Education, reality shows that teachers face difficulties adapting their classes to meet the specific needs of students with disabilities (Posso-Pacheco et al., 2020). This includes the lack of adapted infrastructure, limited resources, and insufficient teacher training (Quiguango Coral, 2024). Consequently, many students do not receive a Physical Education experience tailored to their needs, limiting their holistic development.

This problem is exacerbated in contexts with limited resources, where infrastructure and specialized support are insufficient (Barrett et al., 2019). Therefore, it is essential to analyze the existence of specific curricular adaptations for Physical Education globally to identify effective practices that can be replicated in different contexts.

In this context, curricular adaptation refers to modifications made to the learning environment, teaching methodologies, learning objectives, and resources used to meet the specific needs of students with disabilities or those facing challenges in participating in regular education (Luzón-Sala et al., 2023). Curricular adaptation includes infrastructure changes, such as installing ramps and specialized equipment, to foster equitable learning (Lamata et al., 2024). These adaptations are classified into three levels: Grade 1, which involves physical access modifications; Grade 2, focused on methodological and evaluative changes; and Grade 3, involving adaptations of objectives and learning outcomes established in the national curriculum (Barrera-Proaño et al., 2024).

Inclusion in Physical Education is based on the principles of educational equity, which recognize the right of all students to participate in the educational process, regardless of their physical or cognitive abilities (Organización de las Naciones Unidas, 2006). Curricular adaptations enhance the participation of students with disabilities by improving their motor, cognitive, and socio-emotional skills (Gobbi et al., 2024; Morsanuto et al., 2023).

Although numerous studies have addressed the topic of inclusion in Physical Education, there is a noticeable gap in the literature concerning the specific characteristics and impact of curricular adaptations at the micro-curricular level. Furthermore, limited research explores the practical implementation of these

adaptations within diverse cultural and geographical contexts, highlighting a need for more in-depth analysis (Bernal Alvaro et al., 2024). In response to this gap, the objective of the present study was to analyze the existence and characteristics of specific curricular adaptations for Physical Education on a global scale, drawing upon scientific literature published between 2022 to 2024.

2. Materials and methods

2.1. Search strategy

A scoping review was conducted following the PRISMA-ScR methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews), which offers a structured and systematic approach for reporting scoping reviews (Page et al., 2021; Tricco et al., 2018). This methodological framework enhances transparency and rigor. The search was conducted in the Scopus database in September 2024, using the following keyword strategy: (“curricular adaptations” OR “curriculum modification” OR “curriculum adaptation” OR “curricular adjustments”) AND (“Physical Education” OR “inclusive practices” OR “inclusive education” OR “students with disabilities” OR “adaptive teaching”). The reviewed studies included open-access articles, ensuring accessibility and a comprehensive analysis of the available literature. The temporal scope of the studies ranged from January 2022 to September 2024.

2.2. Selection criteria

The review included studies reporting on the existence and characteristics of curricular adaptations in Physical Education on a global scale. Both qualitative and quantitative studies describing curricular adaptation practices for students with disabilities, learning difficulties, and those in vulnerable situations were considered. The inclusion criteria encompassed empirical studies, case studies, and peer-reviewed articles published from 2022 onwards, in English and Spanish. Conversely, review studies and studies presenting unpublished data were excluded.

2.3. Screening and data collection

The articles retrieved from the searches were initially screened based on their titles and abstracts, following the PRISMA-ScR guidelines (Tricco et al., 2018). Selected articles underwent detailed evaluation to determine their final inclusion. The study selection process was documented using a PRISMA-ScR flow diagram, which illustrated the number of records identified, screened, and excluded at each stage.

These elements provided an overview of how curricular adaptations were implemented in Physical Education. Building on this foundation, a thematic analysis was conducted to classify curricular adaptation practices into five key dimensions: adaptation of teaching methodology, inclusive assessment, access to adapted resources, creation of accessible practice environments, and adaptation of learning content. The selection and extraction of data were carried out independently by each author of this study. The extracted data were then compared and discussed collaboratively, ensuring a consistent and coherent interpretation of the identified dimensions.

3. Results and discussion

3.1. Search results

The literature search identified a total of 112 articles. Following an initial screening based on titles and abstracts, 32 studies were selected for a detailed evaluation, of which 16 met the established inclusion criteria (**Figure 1**). Each of the included studies focused curricular adaptations implemented in Physical Education to address the needs of students with disabilities, learning difficulties, students in vulnerable situations, and/or pre-elite and elite athletes.

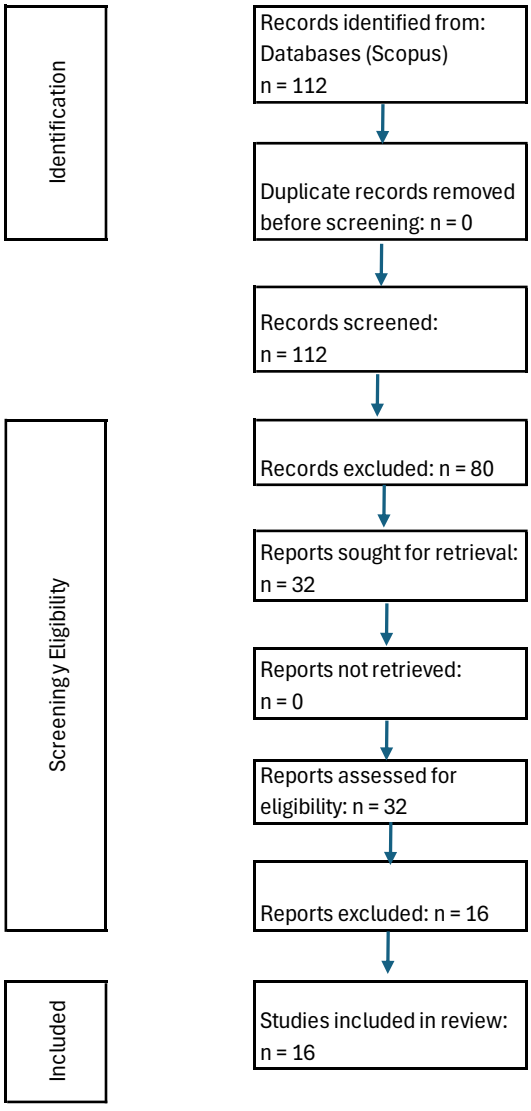

Figure 1. Identification and selection process of studies via databases.

The studies primarily described adaptive strategies within five key dimensions: teaching methodology adaptation, inclusive assessment, access to adapted resources and equipment, accessible practice environments, and adaptation of learning content. Qualitative, quantitative, and mixed methodologies, incorporating some of the following components: analysis of student satisfaction, teacher perception, and resource accessibility.

3.2. Thematic synthesis of included studies

The 16 included articles were analyzed to identify the characteristics of curricular adaptations in Physical Education. **Table 1** summarizes the included studies and classifies their characteristics according to the dimensions identified within the following categories:

- Type of Curricular Adaptation: describes the adaptation implemented in each study. Grade 1 or access adaptation refers to the adaptation of infrastructure, including material, personal, communication, and time resources. Grade 2 or non-significant adaptation refers to adaptations in teaching and assessment methodologies. Grade 3 or significant adaptation refers to adaptations in curricular objectives and learning outcomes.
- Identified Dimension: indicates one of the five dimensions—teaching methodology adaptation, inclusive assessment, access to adapted resources, accessible practice environments, and adaptation of learning content. This provides a framework for understanding the main focus of each intervention.
- Target Population: describes the group of students with disabilities for whom the curricular adaptations were designed.
- Region: identifies the geographic area where the study was conducted.
- Key Findings: summarizes the main results of each study, highlighting the impacts and lessons learned from the implementation.

Table 1. Summary of included studies and classification by dimensions.

Bibliographic Data	Type of Curricular Adaptation	Identified Dimension	Target Population	Region	Key Findings
Castillo-Retamal et al. (2024)	- Grade 1: Infrastructure adaptation (ramps, wheelchairs). - Grade 2: Methodological adaptation and inclusive assessment (Universal Design for Learning - UDL). - Grade 3: Adaptation of objectives and content for students with Special Educational Needs (SEN).	- Teaching Methodology: Inclusive strategies (collaborative work). - Inclusive Assessment: Adapted assessments for Special Educational Needs (SEN). - Access to Adapted Resources: Limitations in adapted resources. - Accessible Environments: Minimal infrastructure for SEN. - Content Adaptation: Lack of training to adapt content.	Students with Special Educational Needs (SEN) in primary and secondary education.	Chile	- Insufficient initial training. - Need for courses and teacher support. - Insufficient resources and infrastructure.
Al-Hadabi et al. (2024)	- Grade 1: Implementation of physical access and communication resources. - Grade 2: Changes in teaching methodologies to include students with sensory disabilities. - Grade 3: Redefinition of curricular objectives for students with intellectual disabilities.	- Teaching Methodologies: Modifications for students with physical disabilities. - Inclusive Assessment: Adaptation of evaluative methods for students with auditory disabilities using assistive devices. - Adapted Resources: Provision of technological resources and support materials for students with visual disabilities. - Accessible Environments: Infrastructure improvements creating accessible environments.	Students with motor, sensory, and intellectual disabilities.	Sultanate of Oman, UAE, and Saudi Arabia	- Adaptations promoted greater inclusion and participation of students with disabilities, enhancing learning opportunities and supporting social integration.

		- Learning Content: Content adaptation, adjusting pace and learning objectives.			
Deng et al. (2024)	- Grade 1: Physical environment adaptations: provision of facilities, specialized equipment, and spaces for activities. - Grade 2: Integration of movement within the classroom and extracurricular activities. - Grade 3: Adaptation of rules, task difficulty, and inclusion of diverse activities.	- Teaching Methodology: Integration of movement and adapted extracurricular activities. - Inclusive Assessment: Equitable assessment by adapting rules and tasks according to abilities. - Adapted Resources: Provision of facilities and adapted equipment to remove barriers. - Accessible Environments: Accessible infrastructure and social support to promote participation. - Learning Content: Rules, tasks, and diversified activities.	Students with physical disabilities, intellectual disabilities, and autism spectrum disorder.	Various countries	- Barriers to participation in physical activities are not only physical but also social and methodological, requiring a comprehensive and collaborative approach to overcome them.
Rahman et al. (2024)	- Grade 2: Methodological adaptation of traditional Indian games for children with cerebral palsy through modifications in game rules, environment, equipment, and time duration.	- Teaching Methodology: The CHANGE IT model of adapted physical activity was used to modify traditional games to be accessible to children with varying levels of functionality.	Students with cerebral palsy at different functional levels.	India	- The adaptations implemented in traditional games resulted in improved activity levels and participation among children with cerebral palsy.
Gobbi et al. (2024)	- Grade 2: Included adaptation of teaching methodologies and assessment through the incorporation of the Personal and Social Responsibility Teaching (TPSR) model.	- Teaching Methodology: TPSR model and active learning strategies were used, incorporating social and emotional skills development. - Inclusive Assessment: Impact on attitudes, self-efficacy, and intention to include peers with disabilities was measured. - Adapted Resources: Provided adapted materials such as multimedia content and disability simulations.	Students with physical disabilities.	Italy	- Significant positive effect on attitudes, self-efficacy, and the intention to include peers with physical disabilities.
Lamata et al. (2024)	- Grade 2: Focused on adapting teaching methodologies to promote inclusion for students with special educational needs.	- Teaching Methodology: Adapted methodology with increased interaction between teacher-student and among students.	Students with special educational needs.	Spain	- Necessary modifications to promote inclusion included the use of new methodologies, greater understanding, and individualized attention towards students.
Astuti et al. (2024)	- Grade 2: Focused on teaching methodology and assessment of locomotor skills through adapted traditional games and sports.	- Teaching Methodology: Specific pedagogical strategies were used to adjust difficulty levels and teaching times, ensuring active and meaningful participation.	Students with mild intellectual disabilities.	Padang, Indonesia	- Adapted traditional games significantly improved students' basic locomotor skills, promoting their holistic development and educational inclusion.
Morsanuto et al. (2023)	- Grade 1: Infrastructure and resources adapted for children with Autism Spectrum Disorder (ASD). - Grade 2: Modification of teaching	- Teaching Methodology: Behavioral Skills Training (BST) model used, including clear instructions, skill modeling, supervised practice, and feedback. - Learning Content: Adaptations to focus on specific cognitive skills	Students with Autism Spectrum Disorder (ASD).	Lazio, Italy	- Continuous participation in adapted physical activities improves cognitive, motor, and social skills of children with ASD, reducing symptoms

	methodologies in adapted sports activities. - Grade 3: Adapted curricular objectives focusing on cognitive and socio-emotional skill development.	development, such as narrative memory, theory of mind, and attention.			and enhancing quality of life.
Holland et al. (2023)	- Grade 2: Includes modified strategies in activities, rules, and equipment, with implementation of personal supports.	- Teaching Methodologies: Includes modifications in activities, rules, and equipment to ensure inclusion. - Adapted Resources: Provided assistants and specialized equipment, with peer support preferred for a normalized environment.	Students with physical disabilities.	Southeast United States	- Teachers must assist each student in developing inclusive practices that suit their individual needs.
Meier et al. (2023)	- Grade 1: Focused on adapting infrastructure and resources, such as sound balls and accessible gyms. - Grade 2: Modifications in teaching and assessment methodologies to facilitate participation.	- Teaching Methodology: Pedagogical strategies consider the needs of students with visual impairment, promoting their autonomy and active participation. - Adapted Resources: Use of sound balls and specialized equipment. - Accessible Environments: Creation and adaptation of safe, navigable spaces like gyms and play areas for students with visual impairments (BVI).	Students with blindness and visual impairment.	Austria	- Physical education teachers either facilitate or limit participation of students with visual impairments, depending on how they manage resources and adaptations. Students suggested innovative technological solutions, such as adaptive sound balls and sensors for running.
Campos Campos et al. (2023)	- Grade 2: Teaching methodologies adapted with sports such as goalball and boccia.	- Teaching Methodology: Implemented an instructional program based on Paralympic sports (goalball and boccia). - Adapted Resources: Utilized adapted materials and resources, such as specific implements for Paralympic sports. - Accessible Environments: Conducted in adapted spaces.	Students with visual and general disabilities.	Chillán, Chile	- Improved student retention due to adapted content.
Carmona López et al. (2023)	- Grade 2: Implemented an adapted teaching methodology. - Grade 3: Adapted objectives and learning outcomes by modifying the Physical Education program to focus on enhancing motor coordination development.	- Teaching Methodology: Implemented an adapted teaching methodology that included the use of Mexican sign language and specific activities to improve motor coordination abilities.	Students with hearing disabilities.	Baja California, Mexico	- Intervention enhanced motor skills, adapting teaching methodologies and curricular content to meet specific needs.
Asunta et al. (2023)	- Grade 1: Adjustments in transportation infrastructure and availability of adapted means, such as bicycles.	- Accessible Environments: Accessibility and availability of adapted sports equipment.	Students with physical, cognitive, social disabilities, and psychological difficulties.	Finland	- Lack of resources and staff competencies are critical challenges for the participation of CAWD (Children and Adolescents with Disabilities) in physical activities.
Manojlovic et al. (2023)	- Grade 1: Involved adjustments in	- Teaching Methodology: Programs adjusted teaching methodology to ensure activities were accessible	Students with intellectual disabilities, autism,	European and Asian countries	- School exercise programs were effective in improving

	infrastructure and resources. - Grade 2: Focused on changes in teaching methodologies, such as adapted training.	and effective for the target population. - Adapted Resources: Included use of adapted resources and equipment that facilitated student participation. - Learning Content: Adjustments made to activity content to align with students' individual objectives, ensuring exercises had a positive impact on their holistic development.	Down syndrome, physical disabilities, cerebral palsy, and mental health disorders.		health-related and skill-related physical fitness components, including cardiorespiratory fitness, muscular strength, flexibility, agility, balance, and coordination.
Robinson et al. (2023)	- Grade 1: Infrastructure adaptations, material resources, support staff, communication, and time adjustments to facilitate sports participation of students with disabilities.	- Adapted Resources: Provided resources and accessible practice environments tailored to students' specific needs.	Students with cognitive disabilities.	Nova Scotia, Canada	- The Game Changers program increased sports participation opportunities for
Andersen and Winther (2023)	- Grade 1: Adapted resources, including specific equipment and materials for individuals with cerebral palsy. - Grade 2: Implementation of adapted physical activities and encouragement of methodologies promoting reflection and active participation.	- Teaching Methodology: Modified teaching strategies to include adapted physical activities and group reflection sessions catering to specific needs. - Adapted Resources: Provided adapted resources and equipment to facilitate participation of participants with various levels of physical ability. - Accessible Environments: Camps were designed to be accessible, providing an inclusive environment.	Students with physical and intellectual disabilities.	Denmark	- Effective participation and skill development through methodological adaptations facilitated sports skill enhancement and inclusive participation.

3.3. Thematic analysis of curricular adaptations in physical education

This section is structured around a thematic analysis of each category: type of curricular adaptation, identified dimension, and key findings. These were contextualized with results derived from integrating the categories target population and region in each section, providing a comprehensive understanding of observed practices at a global level.

3.3.1. Type of curricular adaptation

The studies were divided into three main types of curricular adaptations: Grade 1 (access adaptations), Grade 2 (non-significant adaptations), and Grade 3 (significant adaptations).

Grade 1 adaptations, as reported by Al-Hadabi et al. (2024) and Castillo-Retamal et al. (2024), focused on modifying physical infrastructure to improve access, such as installing ramps and providing communication resources. These adaptations ensured minimum participation of students with motor and sensory disabilities, particularly in regions like Chile and the Gulf countries. Students in primary and secondary education levels faced limitations due to insufficient infrastructure and resources, which affected their effective inclusion.

Grade 2 adaptations involved changes in teaching methodologies and assessment. Gobbi et al. (2024) and Rahman et al. (2024) implemented methodological strategies such as the TPSR model and the adaptation of traditional games, aiming to foster

active and meaningful participation for students with physical and intellectual disabilities. These studies, conducted in Italy and India, led to significant improvements in students' self-efficacy and participation, highlighting the importance of adapting pedagogical practices to meet students' specific needs.

Grade 3 adaptations, described by Carmona López et al. (2023) and Morsanuto et al. (2023), included modifying curricular objectives and content to focus on developing specific skills, such as motor coordination and socio-emotional abilities. These adaptations promoted meaningful and equitable learning for students with hearing impairments and ASD in contexts like Mexico and Italy. The modification of objectives fostered deeper integration, especially for students whose needs could not be met with only physical or methodological adaptations.

3.3.2. Identified dimension

The included studies were classified into five main adaptation dimensions: teaching methodology, inclusive assessment, access to adapted resources, accessible practice environments, and learning content.

In the dimension of teaching methodology adaptation, approaches were identified that ensured active student participation. Astuti et al. (2024) and Lamata et al. (2024) used strategies such as teacher-student interaction and the adaptation of traditional games to promote meaningful learning. These methodologies were implemented in contexts such as Spain and Indonesia, focusing on students with physical and intellectual disabilities. In Spain, the target population included students with special educational needs, while in Indonesia, efforts centered on students with mild mental disabilities, achieving improvements in participation and basic motor skill development.

Inclusive assessment was a prominent dimension in studies by Al-Hadabi et al. (2024) and Gobbi et al. (2024), where evaluative methods were adapted to enhance individual students' capabilities. These assessments involved technological aids and encouraged self-assessment, which benefited students with hearing and physical disabilities in the United Arab Emirates and Italy. In the United Arab Emirates, inclusive assessment addressed the needs of students with sensory disabilities, while in Italy, the focus was on improving attitude and self-efficacy toward inclusion.

Regarding access to adapted resources, studies like those by Campos Campos et al. (2023) and Meier et al. (2023) highlighted the need for specific resources such as sound balls and adapted equipment to ensure the safe and meaningful participation of students with visual impairments. These resources were crucial in Austria and Chile, where budget constraints often limited the availability of such equipment. Morsanuto et al. (2023) demonstrated that in Italy, using adapted materials through the BST model improved the cognitive and social skills of children with ASD. In Chile, adaptations were relevant for students with visual disabilities, while in Austria, the focus was on providing safe environments for students with blindness, emphasizing the importance of adapted infrastructure for physical activity development.

The dimension of accessible practice environments was addressed in studies such as those by Andersen and Winther (2023) and Deng et al. (2024), which highlighted the importance of adapting physical facilities and creating supportive environments. In Denmark, inclusive camps promoted effective sports skill development through

adapted methodologies, while in multicultural contexts, as studied by Deng et al. (2024), social and physical barriers still limit student participation. In these contexts, students with physical and intellectual disabilities benefited from adapted environments, yet also faced challenges such as a lack of social support.

The adaptation of learning content ensured that students benefited from Physical Education, as indicated by Carmona López et al. (2023), who adapted curricular content in Mexico to focus on motor coordination development for students with hearing disabilities, achieving improvements in their motor abilities. Robinson et al. (2023) implemented adaptations focused on developing socio-emotional skills in Nova Scotia, Canada, increasing sports participation and autonomy for students with cognitive disabilities. In these contexts, content adaptation enabled inclusive and enriching participation, especially for students who would otherwise face barriers to accessing learning.

3.3.3. Key findings

The reviewed studies highlighted both progress and challenges in the implementation of curricular adaptations in Physical Education. Castillo-Retamal et al. (2024) indicated that insufficient teacher training remains an obstacle to effective inclusion in Chile, while Gobbi et al. (2024) demonstrated that using the TPSR model improved students' self-efficacy in Italy. Astuti et al. (2024) showed that adapting traditional games enhanced students' locomotor skills in Indonesia, indicating the potential of these strategies to promote inclusion.

Regarding resources, Meier et al. (2023) emphasized the need for innovation in developing materials, such as adaptive sound balls, for students with visual impairments. Similarly, Morsanuto et al. (2023) demonstrated that in Italy, continuous participation in adapted activities enhances social skills and reduces ASD symptoms. In Finland, Asunta et al. (2023) noted that a lack of resources and staff competencies remains a challenge for the participation of students with disabilities, directly impacting their ability to benefit from physical activities.

4. Conclusion

It was identified that the combination of access, methodological, and curricular content adaptations significantly enhances the inclusion and participation of students with any type of disability, as observed in comparative studies implementing different adaptation levels. Interventions that integrated these three types of adaptations simultaneously showed better outcomes in student satisfaction, self-efficacy, and holistic development.

In reviewing studies from various regions of the world, it was noted that the success of curricular adaptations in Physical Education is influenced by geographic and cultural context, including resource availability and attitudes toward inclusion. In other words, strategies effective in countries with greater financial resources and inclusive policies did not have the same impact in regions with infrastructure limitations or lack of social support.

Conflict of interest: The authors declare no conflict of interest.

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