



Does Movement Matter? Motor Activity Stimulation for Children with Autism Spectrum Disorder

Firda Ruhyah Mau'izhah¹, Nur Faizah Romadona², dan Heny Djoehaeni³

^{1,2,3} Pendidikan Guru Pendidikan Anak Usia Dini, Universitas Pendidikan Indonesia

ABSTRAK. Kajian ini bertujuan untuk mensintesis bukti empiris mengenai stimulasi aktivitas motorik pada anak usia dini dengan ASD, mencakup bentuk intervensi, dampak perkembangan, dan tantangan implementasinya. Metode Systematic Literature Review (SLR) dipilih untuk mensintesis bukti empiris mengenai stimulasi aktivitas motorik pada anak dengan ASD dan dilakukan menggunakan diagram alur PRISMA 2020. Dari 251 artikel yang teridentifikasi melalui Scopus dan database pendukung lainnya, sebanyak 13 studi empiris pada anak ASD usia 2–6 tahun terbitan 2021–2026 dipilih dan dianalisis. Hasil kajian menunjukkan bahwa stimulasi aktivitas motorik dilakukan melalui aktivitas gerak dasar, latihan sensorimotor, aktivitas sosial-motor, dan rutinitas sehari-hari dalam konteks rumah, sekolah, terapi, dan olahraga terstruktur. Temuan menunjukkan kontribusi terhadap perkembangan motorik, regulasi sensoris, interaksi sosial, perilaku, dan kemandirian anak. Namun, implementasinya masih menghadapi keterbatasan pemahaman pendidik dan orang tua serta minimnya dukungan institusional. Kajian ini menunjukkan bahwa stimulasi aktivitas motorik pada anak dengan ASD tidak hanya berkaitan dengan kemampuan gerak, tetapi juga regulasi sensoris, kemampuan sosial, dan partisipasi anak dalam aktivitas sehari-hari. Pendekatan multimodal dan kontekstual diperlukan untuk mendukung perkembangan anak sesuai kebutuhan individualnya.

Kata Kunci : Stimulasi Motorik; Autism Spectrum Disorder; PAUD

ABSTRACT. This review aimed to synthesize empirical evidence regarding motor activity stimulation in young children with ASD, including intervention forms, developmental impacts, and implementation challenges. A Systematic Literature Review (SLR) method was selected to synthesize empirical evidence regarding motor activity stimulation in children with ASD and was conducted using the PRISMA 2020 flow diagram. Of 251 articles identified through Scopus and supporting databases, 13 empirical studies involving children with ASD aged 2–6 years published between 2021 and 2026 were selected and analyzed. The findings indicated that motor activity stimulation was implemented through fundamental movement activities, sensorimotor training, social-motor activities, and daily routines across home, school, therapy, and structured sports contexts. The findings also demonstrated contributions to motor development, sensory regulation, social interaction, behavior, and children's independence. However, implementation still faced challenges related to limited understanding among teachers and parents, as well as insufficient institutional support. This review showed that motor activity stimulation in children with ASD was not only associated with motor abilities, but also with sensory regulation, social skills, and participation in daily activities. Multimodal and contextual approaches were needed to support children's development according to their individual needs.

Keyword : Motor Stimulation; Autism Spectrum Disorder; Early Childhood Education

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✉ Corresponding author : Nur Faizah Romadona

Email Address : faizah@upi.edu

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INTRODUCTION

When a child with ASD is observed in an open classroom for just a few minutes, what often stands out first is not how they communicate or connect with others, but how they move or how they struggle to. Although the DSM-5 primarily defines ASD based on difficulties in social communication and interaction, as well as restricted and repetitive behaviors, other developmental symptoms that are no less important should also be considered, especially early impairments in motor development commonly found in individuals with ASD [1]. This has been reported in several studies that approximately 80% of individuals with ASD show noticeable differences in motor functioning [2];[3].

Motor difficulties can even be identified as early as 6 months of age and may predict an ASD diagnosis at 24–26 months, a developmental period that is still categorized as early childhood [4]. Several motor indicators that can be identified include asymmetrical body posture while lying prone, stiff rolling movements, unbalanced walking patterns, and poor body coordination [5],[6]. This indicates that in children with ASD, motor impairments may emerge earlier than difficulties in language and behavioral domains [7]. As children with ASD grow older, motor impairments may contribute to long-term difficulties, including challenges in social, communication, behavioral, and cognitive development [8];[9].

Although motor problems are very common in individuals with ASD, they are often overlooked in clinical practice. Research shows that intellectual disability occurs in about 30–50% of individuals with ASD. In contrast, motor difficulties are reported in the majority of individuals with ASD [2]. However, despite their high prevalence, motor problems are rarely documented by clinicians, with only around 1% of cases being formally recorded [10]. This shows that intervention programs for children with ASD often place greater emphasis on social communication and behavioral symptoms, while motor-related difficulties may receive less attention [11].

To address motor problems in children with ASD, Lourenco revealed that low motor proficiency in children with ASD requires specific motor stimulation to support their participation in various activities [12]. Children with low motor skills are less likely to reach recommended daily physical activity levels, which may increase the risk of physical inactivity. In addition, children with ASD are also at higher risk of overweight and obesity [13]. Therefore, motor activity stimulation is needed to help support these limitations [14].

Motor activity stimulation in the context of ASD has taken various forms across the literature, ranging from structured physical play and rhythmic movement to aquatic activities and sensorimotor exercises [15];[16]. These approaches share a common emphasis on purposeful physical engagement tailored to the child's developmental needs. Unlike passive physical therapy, motor activity stimulation is characterized by active engagement, the child is not simply treated, but encouraged to move, explore, and respond to physical challenges in ways that are meaningful and appropriate to their developmental level [17].

Several studies suggests that motor activity holds meaningful promise for children with ASD with benefits extending beyond motor performance alone. One of these studies was conducted by Ruggeri using a systematic review method involving 41 selected articles. The findings showed that several motor interventions, including gymnastics, trampoline activities, climbing, soccer, and dance, had significant effects on coordination, balance, and muscular strength in children with ASD [18]. Beyond improving physical abilities, these interventions also supported children's participation in daily and physical activities, while encouraging more active engagement with their surrounding environment.

Further findings by Bhat using the SPARK involving children with ASD aged 5–15 years study sample revealed that different motor domains are associated with various developmental aspects in individuals with ASD [8]. Fine motor skills were found to be related to social communication and repetitive behaviors, while coordination and fine motor abilities were associated with cognitive functioning. In addition, visuomotor and fine motor skills were linked to language development.

Furthermore, a study conducted by Nekar involving children and adolescents with ASD aged 6-18 years demonstrated that the use of Augmented Reality (AR)-based games produced positive outcomes in several developmental domains [19]. Participants who received AR-based cognitive-motor training showed improvements in repetitive behaviors, executive functioning, reaction time, and response accuracy compared to the control group. This research suggest that cognitive-motor activities integrated with interactive technology may help enhance cognitive processing, attention, and motor responses in individuals with ASD.

Despite the growing body of research on motor functioning in children with ASD, a comprehensive synthesis of the evidence remains lacking. First, many existing studies include samples that extend beyond childhood, with age ranges reaching up to 15 or even 18 years, making it difficult to draw conclusions that are specific to children. Second, while various forms of motor activity have been explored, no systematic review has specifically mapped the types of play-based and movement activities used, nor examined the challenges associated with implementing these activities in children's daily lives. A comprehensive synthesis focused specifically on children with ASD is therefore both timely and necessary.

This study addresses that gap through a Systematic Literature Review (SLR) examining empirical evidence on motor activity stimulation for children with ASD. Three questions guide this review:

- RQ1. What strategies of motor activity stimulation have been used for children with ASD?
- RQ2. What is the impact of motor activity stimulation on the development of children with ASD?
- RQ3. What are the challenges and considerations in implementing motor activity stimulation for children with ASD?

By systematically mapping and synthesizing the available evidence, this review aims to provide a comprehensive and accessible foundation for understanding the role of

motor activity stimulation in supporting children with ASD, while also identifying priorities for future research.

METHOD

This study employed a *Systematic Literature Review* (SLR) with a qualitative descriptive-explanatory approach to systematically identify, select, and synthesize empirical evidence regarding motor activity stimulation in children with ASD, including intervention strategies, developmental impacts, and implementation challenges [20],[21],[22]. Beyond describing previous findings, this review also explored how motor activity stimulation is implemented in children with ASD, how it contributes to developmental outcomes, and the challenges encountered in its implementation, based on accumulated evidence across studies. The review process followed the PRISMA 2020 guidelines to ensure transparency, reproducibility, and methodological rigor [23].

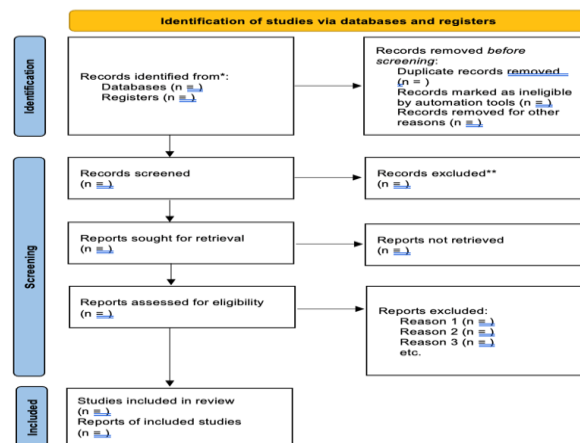


Figure 1. PRISMA 2020

RESULT AND DISCUSSION

Upon reviewing thirteen studies that met the inclusion criteria, this review identified several key findings regarding motor activity stimulation for children with Autism Spectrum Disorder (ASD) in early childhood settings. These findings were organized into three thematic categories aligned with the research objectives: (1) strategies of motor activity stimulation for children with ASD, (2) the impact of motor activity stimulation on children's development, and (3) challenges in implementing motor activity stimulation for children with ASD. To provide an overview of the literature included in this review, Table 4 presents the identity of the selected articles, including the authors, publication year, journal source, and journal quartile. This overview illustrates the distribution and academic quality of the studies synthesized in this review.

Table 1. Article Identity

No	Author	Title	Year	Journal	Quartile
1	Bremer, E. et al.	Baseline behaviour moderates movement skill intervention outcomes among young children with autism spectrum disorder	2021	Autism	Q1

No	Author	Title	Year	Journal	Quartile
2	Sung, Y.-S. et al.	Physical Activity and Motor Performance: A Comparison Between Young Children With and Without Autism Spectrum Disorder	2021	Neuropsychiatric Disease and Treatment	Q2
3	André, A. et al.	Dynamics of the interaction between adults and a preschool child with autism: Transition from segregated to inclusive settings	2022	Frontiers in Education	Q2
4	Prieto, L.A.	A Randomized Parent-Mediated Physical Activity Intervention for Autistic Children	2023	Autism Research	Q1
5	Yang, Y. et al.	Effects of Mini-Basketball Training Program on Social Communication Impairments in Preschool Children with ASD	2024	BMC Sports Science, Medicine and Rehabilitation	Q2
6	Denisova, K. & Wolpert, D.M.	Sensorimotor Variability Distinguishes Early Features of Cognition in Toddlers with Autism	2024	iScience	Q1
7	Draudvilienė, L. et al.	Two Physiotherapy Methods to Improve the Physical Condition of Children with Autism Spectrum Disorder	2024	Children (MDPI)	Q2
8	Schaaf, R.C. et al.	A Comparative Trial of Occupational Therapy Using Ayres Sensory Integration and Applied Behavior Analysis Interventions for Autistic Children	2025	Autism Research	Q1
9	Savarese, G. et al.	Preliminary Results of Sensorimotor Room Training for the Improvement of Sensory and Motor Skills in Children with Autism Spectrum Disorders	2025	Pediatric Reports (MDPI)	Q3
10	Hatipoğlu Özcan, G. et al.	Effects of Motor Intervention Program on Academic Skills, Motor Skills and Social Skills in Children with Autism Spectrum Disorder	2025	Journal of Autism and Developmental Disorders	Q1
11	Song, Y. et al.	Virtual parent-mediated yoga for children with autism and their parents: A pilot study	2026	Research in Autism	Q2
12	Jafari, A. et al.	Comparative effects of karate and basketball interventions on social communication and physical fitness in preschool children with autism spectrum disorder	2026	Research in Autism	Q2
13	Tazinaffo, L.S.	Performance of Daily Living Activities of Autistic Children With Sensory Processing Difficulties: Caregivers' Perceptions	2026	Occupational Therapy International	Q1

Building on this overview, the diversity of interventions and study contexts presented in Table 4 highlights the need for a more integrative interpretation of how motor activity stimulation operates across different settings and populations. Therefore, Table 5 presents a thematic synthesis of findings across the three categories, namely strategies, impacts, and implementation challenges. This synthesis allows for a more coherent understanding of recurring patterns, key consistencies, and contextual variations identified across the included studies.

Table 2. Motor Activity Stimulation, Impact, and Challenges

No	Author	Year	Motor Activity Stimulation	Impact	Challenges
1	Bremer, E. et al.	2021	12-week program: running, jumping, hopping (locomotor); standing on one leg, beam walking (balance); catching, throwing, kicking (object	Children showed improved running, jumping, and catching skills; disruptive and repetitive behaviors	Children with more severe behavioral difficulties at baseline showed smaller improvements; program outcomes varied significantly across

No	Author	Year	Motor Activity Stimulation	Impact	Challenges
			control)	during sessions	individuals
2	Sung, Y.-S. et al.	2021	Daily physical activity including free outdoor play, running, climbing, jumping, and structured movement games	Children who were more physically active showed better running form, balance, and throwing accuracy	Children with ASD engaged in significantly less physical activity than typically developing peers; many preferred sedentary activities
3	André, A. et al.	2022	Teacher-guided gross motor activities in inclusive preschool: rolling balls, obstacle courses, circle movement games alongside typically developing peers	Child showed increased initiation of play with peers; reduced isolation during physical activities; more eye contact during motor tasks	Frequent adult prompting still needed; child struggled to initiate motor play independently; peer interaction remained brief and adult-dependent
4	Prieto, L.A.	2023	Parent-delivered activities at home and outdoors: running races, jumping on trampoline, throwing and catching with soft ball, kicking ball into goal, skipping with rope	Children showed improved running speed, jumping height, and catching accuracy; more willing to engage in physical play with parents and siblings	Some parents inconsistently delivered sessions; online workshop format limited hands-on coaching; children with high sensory sensitivity sometimes refused certain activities
5	Yang, Y. et al.	2024	Mini-basketball training: dribbling with small ball, two-hand chest pass, underhand throwing into low hoop, partner catching drills	Reduced difficulty in making eye contact and taking turns during play; improved hand-eye coordination and ball-handling skills	Sessions required one-on-one or small group supervision; children lost focus without constant adult guidance
6	Denisova, K. & Wolpert, D.M.	2024	Reach-and-grasp tasks, finger tapping, arm movement repetition using motion capture sensors to measure sensorimotor consistency in toddlers	Toddlers with higher sensorimotor variability showed weaker early cognitive and social responses; early motor irregularity identified as a marker of later developmental difficulties	Measuring precise sensorimotor patterns in toddlers under age 3 requires specialized equipment and controlled lab conditions
7	Draudvilienė, L. et al.	2024	Method 1 — gym exercises: balance beam, hopping on one foot, crawling through tunnels, ball throwing; Method 2 — interactive smart board with balance platform: stepping, shifting weight, reaching to touch moving targets on screen	Both methods improved standing balance, body coordination, and motor reaction time; smart board method showed stronger engagement and motivation	Smart board and balance platform require significant financial investment; not available in most regular kindergartens
8	Schaaf, R.C. et al.	2025	Swinging on platform swing, spinning on therapy disc, bouncing on therapy ball, tactile brushing on skin, deep pressure on joints and muscles (proprioceptive input)	Improved ability to dress, eat, and participate in daily routines; reduced sensory overreaction; better tolerance of physical touch and movement	Requires occupational therapist trained specifically in Ayres Sensory Integration; not feasible in standard classroom or home settings without specialist
9	Savarese,	2025	Sensorimotor room	Improved ability to	Dedicated sensorimotor

No	Author	Year	Motor Activity Stimulation	Impact	Challenges
	G. et al.		sessions: jumping on trampoline, crawling through tunnels, rolling on therapy barrel, walking on balance board, squeezing tactile balls	hop, run, and grasp objects; better sensory tolerance (less avoidance of touch and movement); increased attention span during activities	room with specialized equipment needed; sessions must be conducted by trained therapist; not scalable to regular PAUD classrooms
10	Hatipoğlu Özcan, G. et al.	2025	Structured motor program: galloping, skipping, jumping over obstacles (locomotor); balancing on wobble board, walking along lines (balance); catching beanbags, rolling hoops (coordination)	Improved ability to follow instructions during physical tasks; better pencil grip and cutting skills (fine motor); increased sharing and cooperative play with peers	Program requires detailed session plans and practitioner training; difficult to adapt for children with very limited motor ability without individual modification
11	Song, Y. et al.	2026	Parent-guided yoga via video call: tree pose (balance), cat-cow stretch (flexibility), child's pose (calming), breathing exercises with movement	Improved body balance and coordination; children appeared calmer after sessions; parents reported better parent-child physical interaction	Parents with low digital literacy struggled with the online format; some families dropped out due to difficulty maintaining weekly schedule
12	Jafari, A. et al.	2026	Karate group: punching, kicking, blocking movements, structured kata sequences; Basketball group: dribbling, chest pass, layup shooting, defensive footwork drills	Both groups showed improved turn-taking and responsiveness to peers; karate group showed greater improvement in eye contact and verbal initiation; basketball group showed better hand-eye coordination	Both interventions require trained instructors and adequate indoor space; 12-week program demands consistent attendance which was difficult for some families
13	Tazinaffo, L.S.	2026	Sensorimotor activities embedded in daily routines: buttoning clothes, using utensils, picking up objects, manipulating toys, and self-care tasks with tactile and proprioceptive input	Children who received sensorimotor support showed greater independence in dressing and eating; improved grip strength and fine motor precision	Children with severe sensory sensitivity resisted physical contact during tasks; individualized pacing required; difficult to implement consistently in group settings

Strategies of Motor Activity Stimulation for Children with ASD. The findings of this review indicate that motor activity stimulation strategies for children with ASD are implemented through a diverse range of activities involving locomotor skills, balance, coordination, object control, sensorimotor integration, and social-motor activities embedded in daily life. These strategies are applied across various settings including inclusive schools, home environments, sensorimotor therapy rooms, and structured sports programs. In general, motor stimulation for children with ASD extends beyond movement training to encompass sensory regulation, social coordination, and the child's active engagement in everyday activities.

The majority of studies employed structured fundamental movement programs focusing on basic motor competencies. Activities commonly used include running, jumping, hopping, skipping, jumping over obstacles, balancing on beams or wobble

boards, walking along lines, and object control tasks such as catching, throwing, rolling, and kicking [24][25][26]. These activities are generally designed through movement games and structured physical exercises to support children in adapting their body coordination to varying movement demands.

From the perspective of Dynamic Systems Theory (Thelen & Smith, 1994), the diversity of these activities reflects that motor development occurs through the interaction between individual capacities, task demands, and the environment in which activities take place. Varied movement experiences provide children with opportunities to develop body coordination adaptively through diverse motor encounters. For children with ASD, varied motor experiences are particularly important given that the motor difficulties they experience are frequently associated with movement coordination, balance, and the adaptation of bodily responses to changing movement situations.

Beyond fundamental movement, several studies also employed sensorimotor-based and multisensory integration approaches. Activities include jumping on a trampoline, crawling through tunnels, walking on a balance board, rolling on a therapy barrel, tactile brushing, bouncing on a therapy ball, swinging, spinning, and the provision of proprioceptive and vestibular stimulation [27];[28];[29]. These strategies are designed to assist children in improving sensory regulation, tolerance to environmental stimulation, and body movement coordination.

Further findings indicate that motor stimulation for children with ASD is also directed toward sensorimotor capacities and fine motor control. Activities such as reach-and-grasp tasks, finger tapping, unimanual and bimanual object manipulation, and graphomotor-based tracing exercises are employed to develop movement consistency, hand coordination, and motor planning [30];[31];[32]. Several studies demonstrate that children with ASD exhibit elevated movement variability, particularly in the stability of pressure, rhythm, and fine motor coordination. Within the Dynamic Systems Theory framework, this condition indicates that motor development in children with ASD is shaped by the coordination of multiple developmental subsystems, including sensory processing, motor execution, and movement control.

Motor activity stimulation is additionally developed through social activities and group sports. Activities include dribbling, chest passes, underhand throwing, layup shooting, defensive footwork drills, punching, kicking, blocking, and group movement games with peers [33];[34];[35]. These activities engage not only individual movement skills but also social-motor coordination, including following instructions, taking turns, maintaining responsiveness to others' movements, and cooperating within group tasks.

These findings are consistent with Ansuini, who demonstrated that children with ASD are generally capable of basic motor planning in individual tasks but continue to experience difficulties in joint action and coordinated movement with others [30]. This suggests that motor stimulation for children with ASD is not solely concerned with developing individual movement skills but also with fostering the capacity to adapt movement within social interaction contexts.

In addition to the type of activity, this review also demonstrates that the context in which stimulation is delivered influences children's engagement in motor activities. Several studies employed home-based activities such as running races, throwing and catching balls, kicking balls into a goal, skipping rope, and virtual yoga with parental guidance [36];[37]. Others integrated motor stimulation into daily routines, including using utensils, buttoning clothing, object manipulation, and self-care activities [38]. In inclusive school settings, stimulation was facilitated through motor play with peers and teacher guidance during physical activities [33].

From the perspective of Bronfenbrenner's Ecological System Theory, these findings demonstrate that children's development is shaped by active interaction between the child and the environment in everyday life [39]. The involvement of parents, teachers, and peers in motor activities provides children with ASD opportunities to acquire movement experiences in more natural and meaningful contexts. The home, school, and social activity environments constitute essential components in sustaining motor stimulation for children with ASD over time.

The synthesis of findings shows that motor activity stimulation strategies for children with ASD are characterized by the integration of fundamental movement activities, sensorimotor processes, social-motor coordination, and everyday environmental engagement. Multimodal and contextual approaches appear to be more consistently applied in supporting motor development in accordance with individual characteristics and needs.

The Impact of Motor Activity Stimulation on the Development of Children with ASD. Findings across the reviewed studies indicate that motor activity stimulation for children with ASD is associated with developmental changes that extend across multiple domains. Improvements are evident not only in movement capacity but also in sensory regulation, attention, social interaction, behavior, and participation in daily activities. This pattern suggests that motor development in children with ASD does not proceed in isolation from other aspects of development but is deeply intertwined with them.

In terms of motor development, the majority of studies report improvements in body coordination, balance, object control, movement accuracy, and fine motor coordination following motor activity stimulation. These improvements are observed in running, jumping, maintaining balance, hand-eye coordination, graphomotor performance, and object manipulation [24];[32];[29];[35]. Additionally, sensorimotor and multisensory-based approaches demonstrate positive effects on sensory tolerance, bodily regulation, and movement consistency during activity sessions [27];[28].

The impact of motor activity stimulation is also evident in the social and behavioral development of children with ASD. Multiple studies report improvements in sustained eye contact, turn-taking, instruction-following, cooperative behavior, and responsiveness to social interaction during activities [33];[40];[34];[35]. Group motor activities and non-verbal movement-based tasks appear to provide children with natural opportunities for social engagement through play, shared motor coordination, and collectively performed physical activities. Furthermore, Bremer & Lloyd found that

structured motor stimulation also contributed to a reduction in repetitive and disruptive behaviors during activity sessions [24].

Several studies further indicate that the impact of motor stimulation extends to attention, learning engagement, and participation in daily activities. Sensorimotor and exploratory activities support improvements in attention, concentration, sensory tolerance, and children's engagement in learning and play [41];[27];[29]. Motor stimulation integrated into daily routines also supports improvements in children's capacity to eat, dress, use utensils, manipulate objects, and perform self-care tasks [28];[38]. Golos further demonstrate that motor stimulation embedded in play, learning, and daily activities supports increased participation in children with ASD, although participation levels remain lower than those of typically developing peers [42].

From the perspective of Dynamic Systems Theory, children's development proceeds through the interconnection of developmental subsystems that mutually influence one another [43]. Changes in motor capacity do not occur independently but are interrelated with changes in sensory regulation, attention, behavior, and social interaction. This framework helps explain why motor activity stimulation in children with ASD is frequently accompanied by developmental outcomes that extend beyond the motor domain. Diverse movement, sensorimotor, and social activity experiences provided through motor stimulation enable children to build more adaptive response patterns to the demands of activities and surrounding environments.

The present review highlights that motor activity stimulation for children with ASD is associated with multidimensional outcomes, including motor development, sensory regulation, social skills, behavior, attention, and participation in daily activities. Such broader outcomes are more consistently reported in interventions that combine movement-based activities, sensorimotor experiences, social interaction, and engagement with the child's everyday environment.

Challenges in Implementing Motor Activity Stimulation for Children with ASD. The implementation of motor activity stimulation for children with ASD does not always proceed optimally, despite extensive documentation of its effectiveness in the research literature. This review demonstrates that implementation continues to face multidimensional challenges, ranging from limited understanding among educators and families, to the diverse individual needs of children, to environmental conditions that have not yet fully supported inclusive practice.

One of the most frequently identified challenges concerns the limited understanding of educators and families regarding the characteristics and needs of children with ASD. Teachers and parents continue to experience difficulties in identifying appropriate stimulation strategies, managing children's behavior during activities, and adapting approaches to individual sensory needs and capacities [44];[45]. The absence of consistent collaboration between schools and families constitutes a further barrier, as stimulation provided at school is not always continued in the home environment. This condition indicates that the effectiveness of motor stimulation depends not only on the program employed but also on the readiness of the child's immediate environment to support the stimulation process on a sustained basis.

Beyond issues of understanding, limited resources and institutional support represent significant barriers to the implementation of motor stimulation for children with ASD. Several intervention approaches require specialized facilities, assistive technologies, and trained professionals whose availability is not uniformly distributed across schools and early childhood education services [44];[27];[28]. High teacher workloads, restricted access to technology, and insufficient practical training render several interventions difficult to apply consistently within daily learning activities. As a result, the effectiveness of stimulation is often determined not solely by program quality but also by the readiness of the support systems available within school and family environments.

Implementation challenges are further associated with the highly diverse individual characteristics of children with ASD. Several studies indicate that children with heightened sensory sensitivity, behavioral regulation difficulties, or more significant motor impairments tend to require more individualized and flexible approaches [46];[24];[32]. In certain cases, children demonstrate resistance to touch, difficulty sustaining attention, or repetitive behaviors that interfere with their engagement in motor activities and classroom learning. These conditions require teachers and therapists to modify activities, adjust stimulation pacing, and provide more intensive support throughout the intervention process.

Nevertheless, several studies indicate that implementation challenges can be reduced through more collaborative and contextually responsive approaches. Teacher and parent training, strengthened school-family collaboration, the use of flexible strategies adapted to children's needs, and the provision of more inclusive learning environments are among the recommendations most consistently proposed in the research literature [46];[44];[45]. These approaches reflect the position that the success of motor stimulation for children with ASD depends not only on the type of intervention employed but also on the quality of the environmental support engaged in the child's daily developmental process.

Overall, this review demonstrates that the challenges of implementing motor activity stimulation for children with ASD are multidimensional in nature, involving individual, institutional, social, and cultural factors. Effective implementation therefore requires an adaptive and collaborative approach supported by inclusive environments, to ensure that motor stimulation is delivered consistently and is responsive to the developmental needs of each child with ASD.

CONCLUSION

This review shows that motor activity stimulation in children with ASD not only plays a role in improving motor skills, but is also associated with the development of sensory regulation, social abilities, behavior, attention, and participation in daily activities. The stimulation strategies identified across studies are generally multimodal and contextual in nature, involving fundamental movement activities, sensorimotor experiences, social interaction, as well as engagement within home and school

environments. From the perspectives of Dynamic Systems Theory and Ecological Systems Theory, motor development in children with ASD appears to be influenced by dynamic and reciprocal interactions between individual characteristics, performed activities, and the surrounding environment in which the child develops. Nevertheless, the implementation of motor stimulation in children with ASD still faces several challenges, including limited understanding among teachers and parents, insufficient institutional resources and support, and high variability in individual needs. These conditions suggest that the effectiveness of motor stimulation is not solely determined by the quality of intervention programs, but also by the quality of environmental support surrounding the child in daily life. Therefore, motor stimulation for children with ASD needs to be developed through more adaptive, collaborative, and context-integrated approaches within both home and school settings. This review also indicates that most existing studies focus on short-term outcomes and are conducted within structured intervention settings.

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