

Creative Adaptive Physical Activities for Gross Motor Development in a Child With Autism

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Abstract. Children with autism may experience motor coordination difficulties that affect participation in physical activities. This study examined changes in gross motor task performance associated with creative adaptive physical activities in one child with autism. A quantitative single-subject approach involved ten sessions organized into an initial baseline phase (A1; two sessions), an intervention phase (B; five sessions), and a final observation phase (A2; three sessions). The participant was a second-year junior high school student living in Bekasi, Indonesia. Activities combined zigzag walking around five cones while carrying a ball and subsequently directing the ball into a basket. Reported percentage scores were examined through descriptive statistics and visual analysis. Performance remained at 32% during the initial baseline, increased to 70–88% during intervention, and reached 93–99% during final observations. Mean scores were 32.0%, 81.6%, and 96.3%, respectively. These findings indicate improved performance on the practiced tasks during the study period. However, the brief baseline, incomplete measurement documentation, and absence of demonstrated experimental control prevent a firm causal conclusion. Further research with reliable assessment procedures, replicated observations, and follow-up measurements is needed to establish broader motor benefits.

Key words: adaptive physical activity; autism spectrum disorder; gross motor skills; motor development; single-subject research

Abstract in Indonesia. Anak dengan autisme dapat mengalami kesulitan koordinasi motorik yang memengaruhi partisipasi dalam aktivitas fisik. Penelitian ini bertujuan mengkaji perubahan kinerja tugas motorik kasar yang berkaitan dengan aktivitas fisik adaptif kreatif pada seorang anak dengan autisme. Pendekatan kuantitatif dengan metode penelitian subjek tunggal diterapkan dalam sepuluh sesi yang terdiri atas fase baseline awal (A1; dua sesi), fase intervensi (B; lima sesi), dan fase pengamatan akhir (A2; tiga sesi). Partisipan merupakan siswa kelas VIII sekolah menengah pertama yang tinggal di Bekasi, Indonesia. Aktivitas memadukan berjalan zigzag melewati lima kerucut sambil membawa bola dan kemudian mengarahkan bola ke dalam keranjang. Skor persentase yang dilaporkan dianalisis menggunakan statistik deskriptif dan analisis visual. Kinerja berada pada 32% selama baseline awal, meningkat menjadi 70–88% selama intervensi, dan mencapai 93–99% pada pengamatan akhir. Rata-rata skor masing-masing fase adalah 32,0%, 81,6%, dan 96,3%. Temuan ini menunjukkan peningkatan kinerja pada tugas yang dilatih selama penelitian. Namun, baseline yang singkat, dokumentasi pengukuran yang tidak lengkap, dan belum terbuktinya kontrol eksperimental membatasi kesimpulan sebab akibat. Penelitian lanjutan dengan prosedur penilaian yang andal, pengamatan yang direplikasi, dan pengukuran tindak lanjut diperlukan untuk memastikan manfaat motorik yang lebih luas.

Kata Kunci: aktivitas fisik adaptif; gangguan spektrum autisme; keterampilan motorik kasar; penelitian subjek tunggal; perkembangan motorik

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INTRODUCTION

Gross motor skills support children's participation in play, physical education, and everyday movement activities. These skills involve locomotion, postural stability, and object control, which enable children to navigate their surroundings and interact with objects. Their development should be understood as multidimensional rather than represented by success in a single activity. Mnejja et al. (2023) identified associations between postural balance and motor proficiency in preschool children, illustrating the contribution of postural control to movement performance. Although these findings cannot be directly generalized to children with autism, they provide a rationale for examining activities that combine balance, directional changes, and object manipulation.

Motor development deserves particular attention in children with autism spectrum disorder (ASD). Fournier et al. (2010) documented substantial motor coordination difficulties across movement domains in their meta-analysis. More recently, Wang et al. (2022) synthesized evidence from 114 studies and identified pronounced gross motor differences between autistic and neurotypical participants, particularly in object-control skills. These findings suggest that motor assessment should extend beyond observing whether children can walk or run. Coordinating movement sequences, controlling the body during directional changes, and handling a ball may reveal difficulties that are less apparent during simpler activities.

Nevertheless, motor difficulties are not uniform across children with ASD. Mohd Nordin et al. (2021) reported differences in gross and fine motor development between children with ASD and typically developing children, with delays more evident in older children within their preschool sample. Zhang et al. (2022) likewise identified uneven developmental profiles in a large multicenter study, with gross motor abilities relatively less affected than several other developmental domains. Together, these studies emphasize the importance of individual assessment. A diagnosis alone does not specify a child's movement capabilities, learning needs, or likely response to an intervention.

The relevance of motor development also extends to participation and broader developmental functioning. Wang et al. (2022) found a modest association between gross motor and social skills in individuals with ASD. In a general preschool population, Veldman et al. (2023) identified associations between particular motor skills and executive functions, including working memory and inhibition. These relationships suggest that movement performance develops alongside other abilities, but they do not establish that improving motor skills necessarily produces cognitive or social improvements. Motor outcomes, attention, and social functioning therefore require separate assessment rather than being treated as interchangeable indicators of intervention success.

Physical activity offers an approach to supporting motor learning in children with ASD. Earlier meta-analyses reported favorable outcomes following exercise interventions, while also indicating differences across intervention formats and participants (Healy et al., 2018; Sowa & Meulenbroek, 2012). Jiang et al. (2024) subsequently synthesized randomized controlled trials and reported beneficial findings for motor skills and stereotyped behavior. This evidence supports further investigation of structured physical activity. However, differences in exercise content, assessment instruments, intervention duration, and participant characteristics mean that these findings cannot establish the effectiveness of every activity or justify identical programming for all children.

Evidence from specific intervention settings further illustrates both potential benefits and uncertainty. Vodakova et al. (2022) reported improvements in aquatic and gross motor skills following a Halliwick-based program involving seven children with ASD. Baptista et al. (2023) also described improvements following a Therasuit intervention, while acknowledging the need for larger, controlled studies. Conversely, Hocking et al. (2022) found that a virtual reality exercise program was feasible but provided little evidence of improvement in gross motor skills. These contrasting findings demonstrate why feasibility, participation, and motor improvement should be evaluated separately when judging the value of an intervention.

The selection of movement tasks is another important consideration. Wang and Zhou (2024) found that targeted motor training improved gross motor outcomes compared with ordinary activity among healthy preschool children, although substantial heterogeneity was present. Their findings provide indirect support for clearly specified practice rather than assuming that activity participation alone develops every motor domain. Similarly, Li et al. (2022) found that active video games improved locomotor and stability skills in children with diverse developmental conditions, whereas effects on object-control skills remained uncertain. Consequently, combining walking and ball tasks requires attention to the distinct demands of each component.

In the present study, creative adaptive physical activity refers to a movement sequence involving zig-zag walking around five cones while carrying a ball, followed by directing the ball into a basket. The sequence brings locomotor control and object manipulation into a practical activity using familiar equipment. Its proposed value lies in providing observable opportunities to coordinate movement rather than in introducing an established therapeutic protocol. Although specialized interventions may offer benefits, studying a simple movement sequence can contribute information about individual task performance in a community setting. Transfer to unpracticed activities, however, cannot be assumed.

Appropriate measurement is essential when interpreting changes during such activities. Clark et al. (2021) emphasized the importance of accuracy, repeatability, usability, and transparent reporting in motor assessment. Prieto et al. (2022) also examined the feasibility of administering a standardized motor assessment remotely to children with ASD, illustrating the need to evaluate assessment procedures within their delivery context. A percentage derived from performance on a particular course does not necessarily represent overall motor proficiency. Improvements may reflect learning the sequence, greater familiarity with instructions, or changes in assistance, making clear scoring criteria and consistent observation conditions important.

Repeated observations can help describe how performance changes within an individual. Single-subject research provides a framework for comparing outcomes across conditions, but causal interpretation requires more than an upward pattern of scores. Baseline characteristics, measurement consistency, and demonstrations of experimental control must also be considered (Byiers et al., 2012). Against this background, the present study examined reported gross motor task performance in one child with ASD across initial baseline, intervention, and final observation phases in Bekasi, Indonesia. Its objective was to describe the direction and magnitude of change during creative adaptive physical activities while distinguishing improvement on practiced tasks from broader motor development and established therapeutic efficacy.

METHODS

The study used a quantitative single-subject research approach to examine changes in gross motor task performance associated with creative adaptive physical activities. Repeated measurements were organized into three sequential phases, designated A1–B–A2: an initial baseline phase comprising two sessions, an intervention phase comprising five sessions, and a final observation phase comprising three sessions. Although the study was originally described as an A–B–A design, the procedures for withdrawing the intervention during A2 were not sufficiently documented. Accordingly, A2 was treated as a final observation phase rather than a confirmed reversal condition. This distinction is important because improvement across phases alone does not establish experimental control or a causal relationship (Byiers et al., 2012).

The participant was one child, identified by the initial K, who was described as having autism and was enrolled in the second year of junior high school. The study took place at the Mutiara Gading Timur residential complex in Bekasi, Indonesia, from 6 to 28 June 2024. The available study records did not specify the participant's chronological age, diagnostic assessment, recruitment procedure, or concurrent interventions. Creative adaptive physical activity was the intervention variable, while the reported gross motor task performance score was the outcome variable.

The activity involved walking along a zig-zag route marked by five cones while carrying a ball, followed by directing the ball into a basket held by the researcher at the end of the route. The sequence combined locomotor and object-control tasks. The intervention was implemented during phase B, with performance observations recorded across all three phases. However, the original description did not consistently distinguish between placing and throwing the ball into the basket. Session duration, repetitions, equipment dimensions, prompting, physical assistance, and progression criteria were also not documented sufficiently to permit precise replication.

Data were collected through a gross motor task assessment described as using Guttman-type dichotomous scoring, with values of 1 and 0. Performance was reported as a percentage for each session. However, the assessment items, operational definitions of successful performance, maximum possible score, and percentage calculation and rounding procedures were unavailable. Consequently, the reported percentages were retained as recorded and could not be independently reconstructed from item-level data. Instrument validity, interobserver agreement, and intervention fidelity were not documented.

Data were analyzed descriptively and visually through within-phase and between-phase comparisons. Within-phase analysis examined the number of observations, score range, arithmetic mean, overall direction of change, and difference between the first and last scores in each phase. Between-phase analysis examined changes at successive phase boundaries and overlap between the observed score ranges. Boundary changes were calculated by subtracting the final score of the preceding phase from the first score of the subsequent phase and were expressed in percentage points. Range overlap was defined as the proportion of observations in a subsequent phase falling within the preceding

phase's minimum-to-maximum range. No quantitative stability classification was assigned because the original records did not specify a stability criterion. No inferential statistical test was conducted; therefore, the analysis described observed changes without claiming statistical significance or conclusive intervention effects.

RESULTS AND DISCUSSION

Changes across the ten sessions

Both initial baseline scores were 32%. During intervention, the five scores were 70%, 82%, 82%, 86%, and 88%. The final three scores were 93%, 97%, and 99%. Figure 1 displays the complete sequence. Mean scores were 32.0% in A1, 81.6% in B, and 96.3% in A2. The final observation exceeded the initial observation by 67 percentage points.

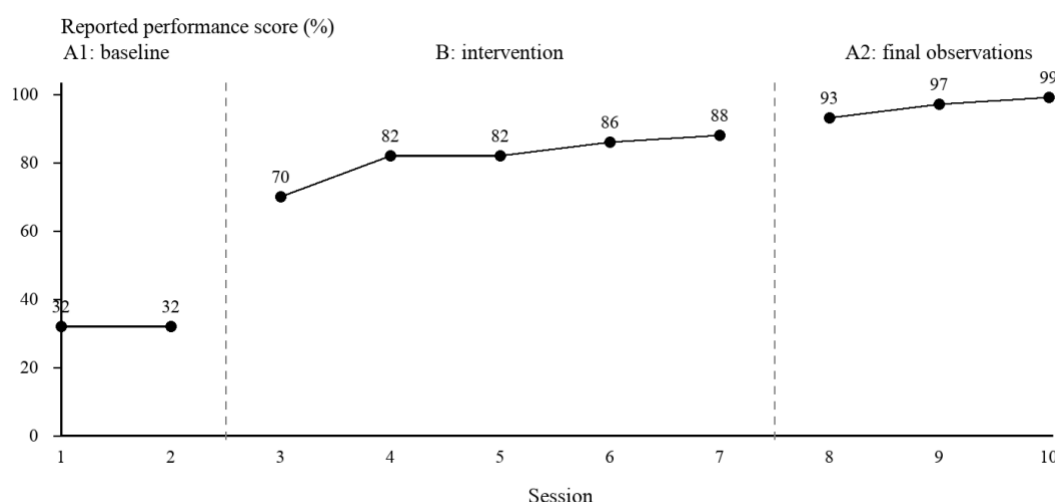


Figure 1. Reported gross motor task performance across the A1, B, and A2 phases. Dashed lines indicate phase boundaries; points are connected only within phases

Within-phase description

The A1 scores were unchanged, while the intervention phase showed an overall increase with a repeated score of 82% at sessions 4 and 5. All three final observations increased. The within-phase changes were 0 percentage points for A1, 18 for B, and 6 for A2. Table 1 distinguishes these changes from the score levels themselves.

Table 1. Descriptive summary of performance within each phase

Measure	A1	B	A2
Number of sessions	2	5	3
Session scores (%)	32, 32	70, 82, 82, 86, 88	93, 97, 99
Mean score (%)	32.0	81.6	96.3
Observed range (%)	32–32	70–88	93–99
Overall direction	Flat	Increasing	Increasing
First-to-last change (percentage points)	0	+18	+6

Note. Means are rounded to one decimal place. Direction is a descriptive characterization of the observed sequence; no formal slope or stability test was applied.

Between-phase description

At the A1-to-B boundary, the score increased from 32% to 70%, a change of 38 percentage points. At the B-to-A2 boundary, it increased from 88% to 93%, a change of 5 percentage points. All intervention observations exceeded the observed A1 range, and all A2 observations exceeded the observed B range. Thus, descriptive range overlap was 0% for both successive comparisons (Table 2).

Table 2. Changes at successive phase boundaries

Comparison	Boundary scores (%)	Change in percentage points	Range overlap (%)
A1 to B	32 to 70	+38	0
B to A2	88 to 93	+5	0

Note. Range overlap is the proportion of later-phase observations within the preceding phase's observed minimum-to-maximum range. It is a descriptive measure, not a significance test or a measure of association

The observed results indicate an improvement in the participant's recorded performance on the practiced movement sequence. Scores increased from 32% in both initial baseline sessions to 70–88% during intervention and 93–99% during the final observation phase. This pattern demonstrates a descriptive change across the study period and supports further investigation of the activity. However, the outcome represents performance on the tasks assessed rather than a comprehensive measure of motor development. The findings should therefore be interpreted as preliminary evidence of improved task performance in one participant, with the mechanisms and broader significance remaining uncertain.

The direction of improvement is consistent with research identifying potential benefits of physical activity for children with autism spectrum disorder. Jiang et al. (2024), in a meta-analysis of randomized controlled trials, reported favorable findings for motor skills following physical activity interventions. Earlier syntheses also identified benefits associated with exercise participation, although intervention formats and outcomes varied considerably (Healy et al., 2018; Sowa & Meulenbroek, 2012). These findings provide a relevant context for the present observations. Nevertheless, consistency in direction does not demonstrate that the current program produced effects comparable in magnitude, reliability, or duration to those reported elsewhere.

The combination of zig-zag walking and ball handling is relevant to the motor domains frequently examined in autism research. Wang et al. (2022) identified substantial gross motor differences between autistic and neurotypical participants, with particularly pronounced difficulties in object-control skills. The present sequence required the participant to negotiate changes in direction while carrying an object and subsequently directing it toward a target. These components provide opportunities to observe different movement demands within one activity. However, because component scores were unavailable, the results cannot identify whether improvement occurred primarily in walking, ball handling, target accuracy, or completion of the overall sequence.

Evidence concerning ball skills also highlights the distinction between successful task completion and movement quality. Todd et al. (2021) identified differences in the developmental proficiency and kinematics of overhand throwing among college students with and without autism. Although that population differs from the participant in this study, the findings illustrate why directing a ball toward a target does not fully characterize throwing proficiency. A successful attempt could involve different movement strategies. Consequently, higher scores in the present study cannot establish improvements in preparatory movements, trunk coordination, release mechanics, or other technical features that were not separately assessed.

Repeated exposure offers one plausible explanation for the observed progression. Practicing the same route may have helped the participant anticipate directional changes and understand the sequence linking walking, carrying, and directing the ball. Research in other populations provides indirect support for structured motor practice. Wang and Zhou (2024) reported favorable effects of targeted motor training among healthy preschool children, while Pham et al. (2021) found improved motor outcomes following a ball-based educational program in primary school pupils. These studies support investigating structured practice, but their populations and procedures differ from the present case and cannot establish its underlying mechanism.

The improvement may also reflect increasing familiarity with the assessment situation. Understanding the researcher's instructions, anticipating the basket's position, or becoming accustomed to the equipment could have contributed to higher scores. These possibilities are compatible with learning, but they do not necessarily indicate broader motor development. The available records do not distinguish between improved physical execution and improved understanding of the task requirements. Accordingly, the observed change is best understood as an improvement in performance under the recorded conditions, without assigning a specific contribution to motor coordination, comprehension,

confidence, or familiarity.

Researcher support is another potentially relevant influence. The researcher held the basket, making the interpersonal and physical arrangement part of the task context. Differences in basket position, encouragement, demonstration, or assistance could affect successful completion, although the records do not establish whether such differences occurred. Malucelli et al. (2021) reported developmental benefits following parental coaching in young children with autism, illustrating that structured adult interaction can be an intervention component in its own right. That study does not explain the present findings, but it reinforces the importance of documenting adult support when interpreting changes during movement activities.

Sensory characteristics of the environment may also deserve consideration in future investigations. De Domenico et al. (2024) reported promising findings from an intervention integrating a multisensory environment with usual treatment for preschool children with autism. Their study involved a specialized sensory setting and therefore differs substantially from the residential activity examined here. Nevertheless, it suggests that environmental conditions may be relevant to intervention design. Noise, surface characteristics, visual distractions, and equipment features were not systematically reported in the present study. Their influence on participation or performance remains a possibility rather than an explanation supported by the collected data.

Comparisons with other adapted activities demonstrate that improvement can be specific to particular outcomes. Vodakova et al. (2022) observed improvements in aquatic and gross motor skills following a Halliwick-based intervention, while some participants did not improve in aspects of adjustment related to breathing control. Similarly, Li et al. (2022) found that active video games benefited locomotor and stability skills in children with diverse developmental conditions, whereas effects on object-control skills remained uncertain. These findings caution against assuming uniform improvement across domains. The combined score used here cannot reveal whether every component benefited equally or whether one component accounted for most of the change.

Not all promising intervention formats produce clear motor gains. Hocking et al. (2022) demonstrated the feasibility of a virtual reality exercise program for young people with autism but found little evidence of improvement in gross motor skills. This distinction between feasibility and effectiveness is pertinent to the present activity. Participation and repeated completion suggest that observations could be obtained within the setting, but they do not establish acceptability, enjoyment, safety, or therapeutic effectiveness. Those outcomes require their own measures. The practical simplicity of cones, a ball, and a basket should likewise not be treated as evidence of demonstrated cost-effectiveness.

The continued increase during A2 requires particular care. Scores of 93%, 97%, and 99% show that recorded performance remained above the initial baseline during the final observations. However, the documentation does not establish whether instruction, prompting, practice opportunities, or other intervention elements were withdrawn. The phase therefore cannot be interpreted confidently as a reversal condition or an assessment of independent retention. Continued improvement might reflect accumulated practice, retained learning, ongoing support, or several influences together. The data demonstrate a temporal pattern, but they do not identify which explanation accounts for the higher final scores.

The absence of overlap between phases strengthens the descriptive observation that the scores differed, but it does not independently demonstrate experimental control. Every intervention score exceeded the initial baseline range, and every final-phase score exceeded the intervention range. Nevertheless, a clear separation can occur without excluding alternative explanations, particularly when baseline observation is brief and intervention effects are not replicated. Byiers et al. (2012) emphasize the importance of design features and patterns of experimental control in single-subject research. Consequently, the non-overlap observed here should not be described as statistical significance, proof of effectiveness, or evidence that outside influences were absent.

The findings also provide no direct basis for conclusions about attention or social functioning. Wang et al. (2022) reported an association between gross motor and social skills in autism, while Veldman et al. (2023) identified relationships between motor abilities and executive functions in preschool children. Such associations do not establish that improved movement performance causes corresponding changes in other developmental domains. Following instructions or participating in an activity cannot demonstrate an absence of concentration difficulties. Because attention, communication, and social

participation were not independently measured, the present interpretation should remain limited to the recorded motor task outcome.

Individual developmental differences further constrain interpretation. Mohd Nordin et al. (2021) reported motor delays in children with autism, while Zhang et al. (2022) identified uneven profiles across developmental domains in a large preschool sample. These findings indicate that autism does not imply a uniform pattern of strengths and difficulties. The participant's response may depend on characteristics that were not documented, including prior movement experience, understanding of instructions, and support needs. The contribution of this study is therefore an individual performance trajectory within a specific activity, rather than evidence that the same progression should be expected across children with autism.

Limitations and implications

The principal limitation is the restricted basis for generalization. Only one participant was observed in one residential setting, and the available records provide limited information about that participant's developmental and intervention history. A single-participant design can offer valuable individual evidence, but its strength depends on repeated measurement and adequate experimental control. Here, the findings cannot establish an average treatment effect or identify which children might benefit. Future studies should describe participant characteristics sufficiently to support interpretation while protecting confidentiality and should examine whether similar patterns occur across individuals with different motor abilities and support needs.

The two-session initial baseline provides only a narrow representation of performance before intervention. Identical scores indicate no observed variation across those two measurements, but they do not establish a stable longer-term pattern. Additional observations could have revealed fluctuations, emerging improvement, or sensitivity to contextual conditions. Byiers et al. (2012) discuss the importance of baseline characteristics when evaluating changes in single-subject research. Future investigations should plan baseline observation around methodological requirements and the expected variability of the outcome, rather than assuming that two matching scores are sufficient to characterize performance reliably.

Uncertainty about the A2 procedures further limits the design. Without documentation of what changed after intervention, the label A–B–A does not establish a withdrawal experiment. For acquired movement skills, a return toward initial performance may also be an inappropriate expectation, making design selection important. Future studies could consider a multiple-baseline approach across participants or behaviors when withdrawal is unsuitable. Such a design would require carefully planned measurement and staggered intervention introduction. It would strengthen the investigation by seeking replicated evidence associated with intervention timing rather than relying on a single progression through three labeled phases.

Measurement documentation is another substantial limitation. The assessment was described as binary, but the item list, success criteria, number of opportunities, total possible score, and rounding rules were unavailable. Consequently, the reported percentages cannot be independently checked against their denominators. The numerical precision of scores such as 97% and 99% should not be interpreted as established assessment accuracy. Future studies should retain the original item-level records and provide a scoring manual that explains exactly how observations become scores. This would make calculations reproducible and allow readers to judge whether changes represent meaningful differences in performance.

The outcome also combines potentially distinct abilities. A total score can conceal improvement in one component alongside little change in another. Future assessment should therefore distinguish locomotor execution, control of the carried object, and performance at the basket, using definitions appropriate to the actual task. A standardized measure may provide complementary information if its age range and intended population suit the participant. Prieto et al. (2022) examined the feasibility of remotely administering the Test of Gross Motor Development–3, illustrating the importance of evaluating assessment procedures within their delivery context. Their study does not justify applying an instrument without checking its suitability.

No independent observation or reliability estimate was documented. This prevents evaluation of whether another assessor would assign the same scores to the same performances. Future studies should train assessors, define ambiguous responses, and report agreement using an appropriate method. Video

recordings, where consent and privacy protections permit, could support independent rescoring. Technology may also assist measurement, but it does not automatically solve validity problems. Clark et al. (2021) highlighted the need to validate technological motor assessment approaches for accuracy, repeatability, and usability. The priority is a defensible measurement process rather than equipment complexity.

The intervention description is insufficient for precise replication. Missing information includes session duration, number of attempts, cone spacing, route dimensions, ball characteristics, basket position, prompting, and assistance. Even the distinction between placing and throwing the ball remains unresolved. These details matter because they determine task difficulty and the support available to the participant. Future protocols should specify the activity sequence and permissible adaptations before implementation. A fidelity record could then document whether the planned procedures were followed and explain any deviations, helping distinguish changes in participant performance from changes in task demands.

The study cannot separate the influence of the intervention from repeated testing or other experiences during the observation period. Concurrent therapy, school activities, home practice, and changes in adult support were not documented. These factors are potential competing explanations rather than established causes of the improvement. Future research should record relevant concurrent activities and maintain consistent assessment conditions where possible. Experimental replication would provide stronger evidence than merely increasing the number of observations. Additional sessions are useful when they clarify the relationship between conditions and outcomes, not simply when they extend the time series.

The observation period does not establish maintenance or generalization. High scores in the final three sessions describe performance during those sessions, but no later follow-up or assessment of unfamiliar tasks was documented. Future studies should distinguish retention of the practiced sequence from transfer to other movement situations. Follow-up assessments could examine performance after a defined interval, while transfer assessments could use different routes, equipment, or activity settings. These procedures should be planned explicitly because success on an unchanged course may reflect familiarity. Neither lasting benefit nor broader functional improvement can be inferred from the present final-phase scores alone.

Interpretation of intervention duration should also remain cautious. The available literature includes programs with substantially different schedules and contents. Vodakova et al. (2022) examined a seven-week aquatic intervention, whereas Baptista et al. (2023) described a four-week Therasuit program involving 20 sessions. Those schedules cannot be adopted as equivalent doses for the present activity. Future studies should document both session frequency and the amount of active practice, then investigate how these relate to outcomes. More practice may also interact with fatigue, engagement, and assistance requirements, making a simple session count an incomplete description of exposure.

Practical evaluation should extend beyond motor scores. The activity uses familiar equipment, but the present study did not measure implementation cost, preparation time, caregiver burden, participant enjoyment, or adverse events. Hocking et al. (2022) identified cost and space as relevant barriers to home adoption of a virtual reality intervention, demonstrating that practical suitability involves more than whether an activity can be delivered. Future community-based research should therefore examine acceptability and resource requirements directly. It should also document discomfort, fatigue, refusals, or interruptions, allowing the activity's feasibility to be evaluated alongside any observed performance changes.

Future research must document ethical review, parental or guardian consent, and participant assent or an appropriate process for recognizing willingness to participate. These records were unavailable here and cannot be reconstructed through editorial revision. Research involving children should also specify confidentiality arrangements and procedures for responding to distress or withdrawal. Addressing these ethical and methodological requirements would make subsequent findings more interpretable and reproducible. The present results justify further investigation of the movement sequence as an individualized activity, while leaving its causal effects, durability, broader developmental value, and practical suitability open to systematic evaluation.

CONCLUSION

Creative adaptive physical activities combining zig-zag walking and ball handling were associated with improved performance on the practiced motor tasks in one child with autism. The findings provide preliminary support for further investigation of individualized movement activities in community settings. However, the brief baseline, incomplete assessment and intervention documentation, and absence of demonstrated experimental control limit causal interpretation and generalization. The observed improvement therefore cannot establish therapeutic efficacy or broader motor development. Further studies using clearly defined procedures, reliable outcome measures, replication across participants, and follow-up assessments are needed to evaluate the effectiveness, maintenance, and transfer of these activities to everyday motor functioning.

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