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Enhancing Gross Motor Skills in 5-6 Year Old Children Through Graded Zone Throwing and Catching Ball Play: A Classroom Action Research Study

Sindi Tafrihatul Muntaha[1], Nur Rochimah[2], Ine Nirmala[3]

[1,2,3] Early Childhood Islamic Education Study Program, Faculty of Islamic Studies, Universitas Singaperbangsa Karawang, Indonesia. Email: sinditafrihatul@gmail.com[1], nur.rochimah@fai.unsika.ac.id[2], ine.nirmala@staff.unsika.ac.id[3].

Abstract: Gross motor competence in early childhood supports participation in active play and provides a foundation for later movement, health, and learning experiences. This study examined whether graded-zone throwing-and-catching ball play could improve gross motor performance among children aged 5–6 years in an Islamic early childhood education setting in Karawang, Indonesia. A collaborative classroom action research design was implemented with 13 children (7 girls and 6 boys) through a pre-action assessment and two iterative cycles. Cycle I comprised six meetings, whereas Cycle II comprised four meetings refined on the basis of classroom reflection. The intervention progressed from an easy zone, emphasizing short-distance throws, slow catches, stable posture, and direct modelling, to a challenge zone involving greater distance, faster responses, movement, targets, and simple obstacle courses. Gross motor performance was observed across body coordination, strength, balance, and agility using a four-level developmental rubric. Sixteen retained instrument items demonstrated a Cronbach's alpha of 0.857. The class mean increased from 40.27% at pre-action to 50.96% in Cycle I and 77.94% in Cycle II, exceeding the predetermined 75% classroom success criterion. Final domain means were 80.41% for coordination, 76.44% for strength, 76.08% for balance, and 78.85% for agility. Qualitative observations also indicated more stable posture, faster responses, improved movement sequencing, and greater confidence during ball tasks. The findings suggest that progressively structured, low-cost throwing-and-catching play is a promising classroom strategy for gross motor development, while the single-class action-research design limits causal and population-level inference.

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INTRODUCTION

Gross motor competence is a central component of early childhood development because it enables children to control large-muscle movements, interact physically with their environment, and participate in increasingly complex play and movement experiences. Foundational movement competence is also associated with later physical activity and health-related trajectories, although the strength and direction of these relationships vary across development (Lubans et al., 2010; Robinson et al., 2015). At the kindergarten level, children are expected to consolidate locomotor, stability, and object-control abilities through repeated opportunities to move, explore, and respond to changing task demands. Cross-sectional evidence shows that substantial variation in gross motor development is already visible at approximately five years of age, underscoring the importance of appropriate practice

opportunities rather than assuming that mature movement patterns will emerge automatically (Aye et al., 2017). A systematic review of four- to five-year-old children likewise concluded that early childhood is an important period for developing fundamental movement skills and highlighted continuing concerns about low or inconsistent skill proficiency and balance performance in young children (Dobell et al., 2020).

The intervention literature supports purposeful motor experiences in early education settings. A meta-analysis by Logan et al. (2012) found that motor-skill interventions can improve fundamental movement competence and emphasized that these skills require instruction, practice, and reinforcement. A later systematic review and meta-analysis of childcare and kindergarten interventions reported beneficial effects on fundamental movement skills across diverse programs (Wick et al., 2017), while a more recent review found that combinations of deliberate practice and deliberate play, variation in task content, adequate intervention volume, and support for the adults delivering activities are important features of effective programs (Koolwijk et al., 2024). Recent meta-analytic evidence further indicates that structured interventions are particularly valuable because they provide repeated, organized opportunities for children to practice movement tasks rather than relying exclusively on unstructured activity (Chen et al., 2024). At the early childhood education and care level, intervention effects have also been documented for both physical activity and fundamental movement skills, supporting the role of the educational setting as a practical environment for motor promotion (Grady et al., 2025).

Within the broader domain of fundamental movement skills, throwing and catching are especially relevant because they integrate visual attention, upper-body force production, anticipatory control, postural stability, and rapid adjustment to the direction and speed of an external object. Object-control skills are not only components of many childhood games but also serve as prerequisites for more complex sport and recreational participation. In a randomized controlled trial, Donath et al. (2015) demonstrated that a kindergarten intervention specifically targeting object control could improve skills such as throwing and catching. Similarly, Foulkes et al. (2017) showed that active-play programming can enhance fundamental movement skill competence in preschool children when activities are deliberately organized and supported. These findings suggest that the pedagogical value of ball play does not depend merely on giving children a ball; the task structure, progression, repetition, feedback, and opportunity to respond appear to matter.

The practical problem addressed in the present study emerged from routine learning conditions in Class B2 at RA Miftahul Khoer, Karawang. Initial classroom observation indicated that the 13 children aged 5-6 years had difficulty coordinating eye, hand, and body movements, regulating force when throwing, maintaining stable posture while responding to a moving ball, and reacting quickly to movement cues. The pre-action class mean was 40.27%, well below the 75% classroom criterion established for the action research. These observations were interpreted as a need for more systematic motor stimulation within a play-based learning format. A suitable classroom solution therefore needed to be enjoyable and inexpensive, yet sufficiently organized to provide repeated opportunities for coordination, strength, balance, and agility. Throwing-and-catching activities were selected because they could be implemented with simple balls, hoops, cones, and targets while allowing the level of challenge to be adjusted without changing the core play concept.

Evidence from studies conducted in contexts more comparable to Indonesian early childhood settings strengthens the rationale for this approach. Ahmad et al. (2024) reported

that modified throwing-and-catching games affected gross motor outcomes in kindergarten children, highlighting the pedagogical value of adapting rules and equipment to children's abilities. Safitri et al. (2025) also found improved gross motor outcomes following throwing-and-catching ball play among children aged four to five years. More recently, Malinda et al. (2026) used a two-cycle classroom action research design with five- to six-year-old children and reported improvement across cycles after implementing throwing-and-catching activities. Taken together, these studies support ball-based object-control practice as a feasible strategy in Indonesian early childhood education, while also indicating that classroom adaptation is often required to respond to differences in children's initial abilities and learning pace.

The specific pedagogical solution investigated here was a graded-zone model that organized the same general throwing-and-catching activity into progressive levels of difficulty. In the easy zone, children practiced short-distance throws, slow catches, stable standing, simple targets, and direct teacher modelling. In the challenge zone, task demands were progressively increased through longer or higher targets, faster ball delivery, movement before or after catching, zig-zag pathways, changes in posture, and rapid movement sequences. This progression was designed to preserve the motivational qualities of play while introducing features of deliberate practice: repetition, clear task goals, immediate feedback, and manageable increases in difficulty. The rationale is consistent with evidence that structured practice is more reliable than purely unstructured activity for developing fundamental movement skills (Chen et al., 2024), and with the conclusion by Koolwijk et al. (2024) that deliberate practice can be productively combined with play to support young children's motor learning.

Despite the growing literature on fundamental movement skill interventions, an applied gap remains at the level of day-to-day classroom implementation. Many intervention studies evaluate a fixed program, whereas teachers often need to observe children's responses and modify tasks, grouping, equipment, or feedback during the learning process. The literature identified for this revision provides comparatively limited detail on a two-level easy-to-challenge throwing-and-catching model that is refined iteratively through classroom action research while monitoring coordination, strength, balance, and agility as complementary dimensions. This gap is relevant for resource-constrained early childhood settings because a feasible intervention must work with simple equipment, accommodate heterogeneous ability, minimize waiting time, and allow teachers to increase difficulty in small steps. The action-research format is therefore useful not as a substitute for controlled efficacy research, but as a method for documenting how a motor-learning strategy can be improved in an authentic classroom.

Accordingly, this study aimed to describe the improvement in gross motor performance of children aged 5–6 years following graded-zone throwing-and-catching ball play and to determine whether the class mean could reach the predetermined 75% success criterion after iterative classroom refinement. The study's practical novelty lies in combining progressive task zones with cycle-based modification of media, grouping, movement opportunities, and individualized scaffolding. The analysis focuses on change in four observed domains—body coordination, strength, balance, and agility—together with qualitative evidence from classroom observations, interviews, and documentation. Because the study involved one intact class and no control group, the intended contribution is a contextually grounded account of classroom improvement rather than a causal efficacy

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estimate. The results are expected to inform early childhood teachers seeking a structured but playful and low-cost approach to gross motor stimulation.

METHODOLOGY

A. Research Design and Setting

This study employed collaborative classroom action research to improve an identified instructional problem through iterative planning, action, observation, and reflection. The approach follows the cyclical logic commonly associated with action research, in which evidence generated during implementation is used to revise subsequent action (Lewin, 1946; Purnama et al., 2020). The study was conducted in Class B2 of RA Miftahul Khoer, an Islamic early childhood education institution in Karawang, West Java, Indonesia, during the first semester of the 2025/2026 academic year. Field implementation occurred from late November through December 2025. The researcher collaborated with the classroom teacher throughout the intervention and observation process. Permission to conduct the research was obtained from the school leadership and the class teacher before implementation. For the present manuscript, individual children's names are not reported and results are summarized at class or anonymized individual level.

B. Participants and Research Context

The participants were 13 children aged 5–6 years enrolled in Class B2, comprising seven girls and six boys. The class was supported by one main teacher and one assistant teacher. Selection of the class was purposeful within the action-research context because preliminary observation indicated that gross motor performance had not yet reached the expected classroom criterion. The initial difficulties were evident across four domains used in the study: body coordination, strength, balance, and agility. Children frequently needed verbal guidance to align gaze and hand movement with the ball, some had difficulty scaling force to the target distance, several became unstable when catching or changing posture, and many required additional time to respond to rapidly changing tasks. The classroom therefore provided an appropriate setting for testing and refining a structured play strategy designed to increase meaningful movement opportunities while remaining compatible with normal early childhood learning routines.

C. Graded-Zone Throwing-and-Catching Intervention

The intervention was organized into two progressive task zones. The easy zone was intended to establish basic control and confidence. Typical activities included standing in a stable position, throwing a light or soft ball toward a nearby target from approximately one to two metres, catching a slowly delivered ball with two hands, paired throwing and catching at close distance, and low-tempo relay activities. The teacher demonstrated the movement pattern and provided direct verbal cues concerning gaze, hand position, body posture, and appropriate throwing force. The challenge zone increased one or more task constraints after children demonstrated greater control. Activities included chasing a rolling or dropped ball, throwing or catching while moving, walking around or running through simple cone pathways, moving in a zig-zag pattern before catching, throwing toward a higher or moving target, changing from a squat to standing before receiving the ball, balancing on one leg while throwing, and catching and returning the ball with minimal delay. The underlying principle was progressive difficulty: the core movement remained recognizable while distance, speed, postural demand, environmental complexity,

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or response time was increased. Equipment consisted primarily of plastic or rubber balls of different sizes, hoops, cones or cups, baskets, visual targets, and a speaker used for warm-up activities.

D. Action Cycles and Classroom Refinement

A pre-action observation was conducted before the formal cycles to establish the initial performance profile. Cycle I consisted of six meetings beginning on 28 November 2025. Across these sessions, children were introduced to paired throwing and catching, stationary and moving targets, ball retrieval, faster return sequences, balance tasks, and progressively more demanding movement combinations. Reflection after Cycle I showed that the children had improved but remained below the success criterion. Observations suggested several implementation barriers: task variation and target salience were still limited, children sometimes waited too long for turns because groups were relatively large, and teacher support was often delivered to the whole group rather than matched to individual needs. Cycle II therefore consisted of four revised meetings beginning on 15 December 2025. The revision introduced more visually salient colored targets, greater variation in throwing distance and target height, mini-obstacles and simple pathways, smaller groups to increase movement frequency, additional balls to reduce waiting, and individualized prompting for children who still had difficulty. Specific verbal cues were used to focus attention on the ball, stabilize the body, and reduce delay between catching and returning the ball. The cycle ended when the class mean exceeded the predetermined success criterion.

E. Measures, Data Collection, and Analysis

Gross motor performance was assessed through structured observation. The instrument used a four-level developmental rubric: 4 = very well developed, 3 = developed as expected, 2 = beginning to develop, and 1 = not yet developed. The instrument represented four domains: body coordination, strength, balance, and agility. Following item testing reported in the study, four statements were excluded and 16 items were retained. Internal consistency for the retained items was Cronbach's alpha = 0.857. Data collection also included field notes, teacher interviews, and photographic or classroom documentation to capture changes in movement quality and participation. Quantitative analysis used descriptive percentages and class means for each phase. For comparability, phase results are reported as percentage achievement. The classroom success criterion was a mean achievement of at least 75%. Qualitative data were examined through reduction, organized display, and conclusion/verification procedures consistent with the analytic sequence described by Miles et al. (2014). The two data strands were interpreted together: percentage change indicated whether the classroom criterion was reached, while qualitative evidence was used to explain how movement control and implementation conditions changed across cycles. No inferential statistical test was used; therefore, the manuscript does not describe the observed changes as statistically significant.

RESULTS AND DISCUSSION

A. Results

1. Pre-Action Gross Motor Profile

The pre-action assessment confirmed that gross motor performance was below the classroom success criterion. The overall mean was 40.27%, indicating that many

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observed behaviors were still concentrated in the lower developmental categories. At the domain level, mean achievement was 41.35% for body coordination, 39.42% for strength, 38.94% for balance, and 41.35% for agility. The lowest average was therefore observed in balance, followed closely by strength. Classroom observations provided a consistent qualitative picture. Several children had difficulty coordinating gaze, hand position, and trunk movement when the ball changed direction; some threw with insufficient or inconsistent force; and others became unstable when a catch required a rapid postural adjustment. Agility limitations were especially visible when children had to retrieve a moving ball, change direction, or complete a catch-to-throw sequence without a long pause. These baseline findings justified a structured intervention that could begin with manageable tasks and progressively increase the movement demand.

2. Cycle I: Initial Improvement and Remaining Barriers

After six Cycle I meetings, the class mean increased to 50.96%, a gain of 10.69 percentage points from pre-action. All four domains showed improvement: coordination increased to 52.16%, strength to 50.56%, balance to 50.24%, and agility to 50.88%. The pattern suggests that children were beginning to benefit from repeated throwing-and-catching experiences, but the magnitude of improvement was not yet sufficient to meet the 75% success criterion. In practical terms, children were more willing to attempt the activities and were increasingly able to direct their hands toward the ball or target. However, movement quality remained inconsistent. Some children closed their eyes or hesitated when a ball approached, throwing force declined when distance increased, posture became unstable after rapid turns or unexpected catches, and response times remained slow in tasks that required two actions in succession. Reflection also identified characteristics of the learning environment that could constrain practice: relatively large groups produced waiting time, the visual targets were not sufficiently varied, and generalized teacher instructions did not always meet the needs of children who required additional modelling. These findings became the basis for Cycle II redesign rather than being treated as intervention failure.

Table 1. Overall gross motor achievement across research phases

Phase	Meetings	Mean (%)	Change from prior phase (pp)	Criterion status
Pre-action	1 baseline observation	40.27	—	Below 75%
Cycle I	6	50.96	+10.69	Below 75%
Cycle II	4	77.94	+26.98	Exceeded 75%

Note. pp = percentage points. The 75% value was the classroom action-research success criterion.

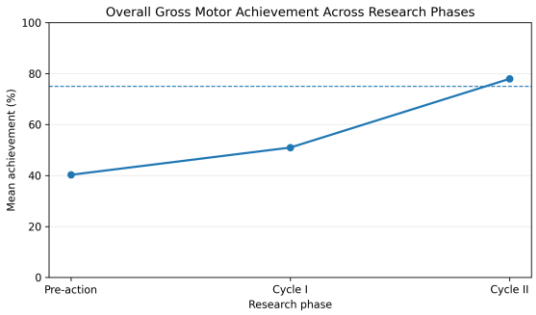

Figure 1. Overall mean achievement increased from pre-action to Cycle II; the dashed line represents the 75% classroom criterion.

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3. Cycle II: Performance After Graded and Organizational Refinement

Cycle II produced a markedly larger improvement following the introduction of visually salient targets, smaller groups, more movement opportunities, individualized scaffolding, and more varied challenge-zone tasks. The overall class mean reached 77.94%, representing a gain of 26.98 percentage points from Cycle I and 37.67 percentage points from pre-action. The final mean therefore exceeded the 75% success criterion by 2.94 percentage points. Of the 13 children, 10 (76.9%) achieved an individual final percentage of at least 75%; the class-level final scores ranged from 71.88% to 83.20%. Domain-level performance also exceeded or closely clustered above the criterion. Body coordination reached 80.41%, the highest domain mean; agility reached 78.85%; strength reached 76.44%; and balance reached 76.08%. From baseline to Cycle II, the corresponding increases were 39.06 percentage points in coordination, 37.50 in agility, 37.02 in strength, and 37.14 in balance. These closely distributed gains indicate that improvement was not confined to a single component of the task. Rather, the children showed progress across visual-motor coordination, force regulation, postural stability, and rapid movement response.

Table 2. Gross motor domain means by research phase

Domain	Pre-action (%)	Cycle I (%)	Cycle II (%)	Pre-action → Cycle II (pp)
Body coordination	41.35	52.16	80.41	+39.06
Strength	39.42	50.56	76.44	+37.02
Balance	38.94	50.24	76.08	+37.14
Agility	41.35	50.88	78.85	+37.50

Note. Percentages are descriptive classroom achievement scores based on the study's observation rubric.

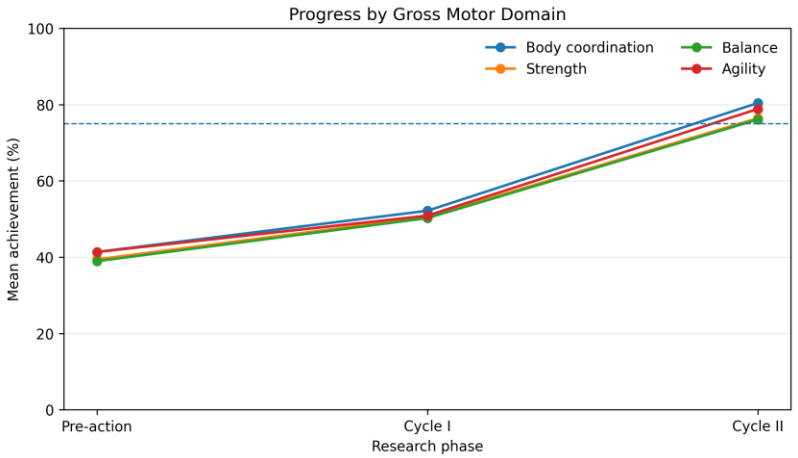

Figure 2. All four monitored gross motor domains showed progressive improvement across the two action cycles.

4. Qualitative Convergence Across the Two Cycles

Field observations during Cycle II were consistent with the percentage trends. Children increasingly coordinated the eyes, hands, and body without continuous verbal prompting and were less likely to avoid or step away from an approaching ball. Throwing force became more stable and better matched to target distance or height. Balance improved during tasks performed in a half-squat or single-leg stance and when

children were required to catch without leaving a defined hoop area. Agility was reflected in faster responses to color cues, more efficient movement through short cone pathways, quicker retrieval of a dropped or bounced ball, and reduced delay between catching and throwing. The teacher also observed greater willingness to try difficult tasks and more sustained participation. Importantly, these qualitative improvements appeared after the intervention was reorganized to increase active turns and individualized support, suggesting that instructional conditions were part of the observed classroom change. The evidence should nevertheless be interpreted descriptively. Because the design used one class without a comparison group and did not employ inferential statistics, the data demonstrate successful classroom improvement within the study context rather than a controlled causal effect.

B. Discussion

The principal finding was a progressive increase in observed gross motor performance across the action-research sequence, from 40.27% at pre-action to 50.96% after Cycle I and 77.94% after Cycle II. The final class mean exceeded the predetermined 75% criterion, and all four monitored domains coordination, strength, balance, and agility showed substantial improvement. This pattern is consistent with the broader intervention literature showing that fundamental movement skills respond to planned practice rather than being solely a product of maturation. Logan et al. (2012) demonstrated positive effects of motor-skill interventions, while Wick et al. (2017) synthesized evidence that childcare and kindergarten programs can improve fundamental movement competence. The present study adds a classroom-level illustration of how those principles can be operationalized using inexpensive ball play in a real early childhood setting.

The pronounced improvement after the second cycle is pedagogically important because Cycle II did not simply repeat Cycle I. The revised cycle changed both task difficulty and the organization of practice. Colored targets increased visual salience, smaller groups reduced waiting time, additional balls increased active opportunities, and individualized prompting addressed differences in readiness. These changes align with the conclusion by Chen et al. (2024) that structured motor interventions are valuable because they provide consistent, repeated, goal-directed practice. They also correspond with Koolwijk et al. (2024), who emphasized the effectiveness of combining deliberate practice with play, offering immediate feedback and repeated opportunities to refine movement while retaining flexibility and enjoyment. In this sense, the graded-zone approach functioned as a practical scaffold: success in simpler conditions prepared children for more complex combinations of speed, direction, posture, and object control.

The improvement in coordination is particularly plausible in light of the task design. Throwing and catching require the child to track an object, anticipate its trajectory, position the hands, stabilize the trunk, and generate a response in a coordinated sequence. Donath et al. (2015) showed that targeted object-control programming can improve throwing, catching, and related skills in preschoolers, and Foulkes et al. (2017) demonstrated benefits from a structured active-play intervention. The present study's coordination mean increased from 41.35% to 80.41%, while field notes described less visual avoidance and more accurate alignment of the body with the ball. Although the observational instrument differs from standardized object-control tests used in those trials, the directional agreement supports the interpretation that repeated, progressively demanding ball experiences helped children organize movement more effectively.

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Strength and balance also improved despite the intervention not being designed as a conventional fitness program. The graded tasks required children to scale throwing force to distance and target height, use larger arm swings, stabilize the trunk, and maintain posture during catches and transitions. Balance demands were deliberately increased through constrained catching spaces, changes from squatting to standing, one-leg throwing, and movement around obstacles. By Cycle II, the strength and balance means had reached 76.44% and 76.08%, respectively. These outcomes should be understood as observed task performance rather than direct physiological measurements of muscular strength or laboratory measures of postural control. Nevertheless, the convergence of quantitative ratings and field observations suggests improved functional control within the play tasks.

The agility pattern provides further evidence that progression in task constraints mattered. During Cycle I, children often paused between catching and throwing, reacted slowly to unexpected ball movement, or required repeated verbal cues before changing position. In Cycle II, activities used rapid color cues, bounced or dropped balls, zig-zag movement, and catch-to-return sequences. The agility mean rose from 41.35% at baseline to 78.85%. This is compatible with the principle that movement competence develops when children repeatedly solve increasingly demanding motor problems. It also reinforces the practical value of manipulating speed and environmental complexity gradually, rather than asking children with low initial competence to perform advanced tasks immediately.

The findings are also broadly consistent with Indonesian studies focused more directly on throwing-and-catching play. Ahmad et al. (2024) reported improved gross motor outcomes after modifying throwing-and-catching games, and Safitri et al. (2025) found positive pre-post changes among young children exposed to ball-throwing play. Malinda et al. (2026), using classroom action research, likewise documented higher gross motor achievement in a second cycle of throwing-and-catching activities. The present study differs by explicitly organizing practice into easy and challenge zones and by documenting the instructional revisions between cycles. This distinction is relevant because it shifts the practical question from whether ball play can be useful to how teachers can calibrate the difficulty and organization of ball play when initial performance is heterogeneous.

From a broader developmental perspective, the study supports the use of early childhood education as a setting for structured movement opportunities. Motor competence has been linked to positive physical-activity and health trajectories (Lubans et al., 2010; Robinson et al., 2015), and Jones et al. (2020) found a positive association between fundamental motor skills and physical activity in the early years. Grady et al. (2025) further showed that early childhood education and care interventions can improve fundamental movement skills. Accordingly, a low-cost routine that increases children's successful movement practice may have value beyond the immediate lesson. However, the current study did not measure habitual physical activity, health outcomes, cognition, or long-term participation, so such broader benefits should be treated as future research questions rather than demonstrated outcomes.

Several limitations constrain interpretation. First, the study involved only 13 children in one intact class, so the findings cannot be generalized statistically to other schools or populations. Second, the absence of a control or comparison group means that maturation, repeated testing, teacher attention, or other classroom experiences cannot be

ruled out as alternative explanations for improvement. Third, the researcher and classroom teacher participated in both intervention delivery and observation, which may introduce expectancy or observer bias. Fourth, the play area sometimes functioned as a passage to the handwashing area, causing distraction, and high enthusiasm occasionally created turn-taking problems; these implementation issues were partly addressed in Cycle II through additional balls, small-group organization, and closer guidance. Fifth, the study did not include a retention assessment, so the persistence of improvement is unknown. Future research should use larger multisite samples, independent or blinded assessment where feasible, standardized motor measures alongside classroom rubrics, comparison conditions, and follow-up testing. These extensions would allow stronger conclusions about efficacy while preserving the practical graded-zone design tested in the present classroom.

CONCLUSION

This classroom action research showed that gross motor performance among 13 children aged 5-6 years improved progressively during graded-zone throwing-and-catching ball play. The overall class mean rose from 40.27% at pre-action to 50.96% after six Cycle I meetings and to 77.94% after four refined Cycle II meetings, thereby exceeding the predetermined 75% classroom success criterion. The final pattern was multidimensional: body coordination reached 80.41%, agility 78.85%, strength 76.44%, and balance 76.08%. Qualitative observations supported the numerical trend by showing more accurate visual-motor coordination, more stable force regulation and posture, faster movement responses, shorter delays between sequential actions, and greater willingness to attempt demanding tasks. The key practical contribution is not simply the use of throwing and catching, but the combination of progressive task zones with iterative instructional refinement. Starting with short, slow, stable activities and advancing toward movement, speed, changing posture, targets, and obstacles allowed the teacher to adjust challenge while maintaining a play-based format. For early childhood classrooms with limited resources, this model offers a feasible way to organize repeated gross motor practice using simple equipment. Nevertheless, the single-class design, absence of a comparison group, observational scoring, and lack of follow-up mean that the findings should be interpreted as evidence of successful classroom improvement rather than proof of causal efficacy. Larger controlled and longitudinal studies are recommended.

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