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Effects of slalom switch, okubuuka, and kykkaa training on kids' athletics level 2 skills among children aged 8-11 years

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ABSTRACT

Background: Early childhood is a critical period for developing fundamental motor skills and physical fitness; however, despite the widespread implementation of kids' athletics programmes, limited research has examined the combined effects of specific training models, such as Slalom Switch, Okubuuka, and Kykkaa, within a structured intervention to improve multiple physical fitness components in children. **Objectives:** This study aimed to examine the effects of a 12-week Kids' Athletics Level 2 training programme on physical fitness in children aged 8-11 years. **Methods:** A quasi-experimental one-group pretest–posttest design was employed involving 40 elementary school students selected through purposive sampling. The intervention was conducted three times per week. Physical fitness was assessed using the Indonesian Student Fitness Test (TKSI), including coordination, accuracy, strength, agility, and cardiovascular endurance. Data were analysed using paired sample t-tests. **Results:** The results showed significant improvements across all variables ($p < 0.05$), with the largest increases observed in coordination (+57.14%) and strength (+50%), followed by accuracy (+50%), endurance (+15.25%), and agility (+10.23%). **Conclusion:** In conclusion, the Kids' Athletics Level 2 training model may be effective in enhancing multiple components of physical fitness in children. However, the absence of a control group limits causal interpretation, and further studies using controlled experimental designs are recommended.

Keywords: Kids' athletics; youth physical fitness; motor skill development; multilateral training; exercise intervention

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INTRODUCTION

Childhood is a phase in which children are highly active in physical activities or sports (Anisah et al., 2020). Physical activity through sport in children is influenced by motor skills considered important in primary school children, namely gross motor skills (Ningrum, 2018). Participation in sport at an early age can develop motor coordination by providing more opportunities to learn and refine motor skills (Abhaydev et al., 2020). Motor skills act as the driving force, governing the entire physical process, including coordination and the regulation

of physical condition, which are influenced by various factors, including physiological and psychological factors, to enable optimal movement, particularly in sporting movements (Chaeroni et al., 2022). Essentially, sport encompasses all systematic activities designed to encourage, nurture, and develop physical, technical, tactical, mental, and social potential (Kardi et al., 2022). Sport is also regarded as a training strategy to stimulate intellectual processes such as attention, memory, creativity, and reasoning and to strengthen abilities such as concentration, problem-solving, strategic planning, and creativity for children with special educational needs (Abhaydev et al., 2020). In light of this, preparation should ideally begin at an early stage, particularly for primary school-aged children. Primary school-aged children are those aged between 6 and 12 years (Damayanti et al., 2019). The first characteristic of primary school children is that they enjoy playing (Sari & Arifah, 2024). This characteristic of primary school children who enjoy playing requires teachers, particularly physical education teachers, to carry out educational activities that incorporate play.

In recent decades, a growing trend across all sports has been grassroots development. Grassroots development combines a participatory approach with local capacity building to empower communities to develop in line with their own local needs and values (Kennedy, 2022). Based on this, World Athletics has developed a new concept focused on children's developmental needs by inspiring enthusiasm for sport among children and fostering mutual interaction through the Kids' Athletics programme. Participants in Kids' Athletics are all children aged between 4 and 14 years, including those taking part in various activities and those with a particular interest in athletics (World Athletics, 2019). The Kids' Athletics programme aims to make athletics the most widely participated sport in schools to educate children about sport, particularly athletics, thereby promoting a balanced and healthy lifestyle (World Athletics, 2019). This programme also aims to address the issue of early specialisation in training programmes to improve performance at a young age and minimise burnout syndrome (Anisah et al., 2020). Through this study, a kids' athletics training model is implemented for primary school children aged 8-11 years. The Kids' athletics training model to be implemented is the Slalom Switch, Okubuuka, and Kykkaa.

The physical skills in kids' athletics Level 2 consist of several basic skills, including balance, body awareness, spatial awareness, coordination, rhythm, agility, reaction, and reactive movement. These physical skills are aimed at primary school children participating in a basic training programme to develop skills such as walking, running, jumping, throwing, catching, rolling, and maintaining balance, which were originally developed in Eastern Europe (Ningrum, 2018). Essentially, these basic skills help children engage in specialised sports training, commonly referred to as physical skill development. The kids' athletics programme utilises various activities to develop pupils' motor skills. Through kids' athletics, pupils will learn various physical skills in the form of games within an engaging and enjoyable atmosphere (Yusup & Agus, 2021). Kids' athletics is designed to provide enjoyment, exercise, new training models, and a variety of physical skills, thereby requiring mastery and teamwork within a group at each different level (Fauzan, 2021). Research findings reveal that motor skills and anthropometric measurements change in both male and female students following participation in an athletics programme (Başkaya et al., 2023). In this study, three kids' athletics training models is implemented as an effort to optimise the physical skills of students aged 8-11 years.

Based on the results of observations and previous findings. This study is based on the majority of existing research on kids' athletics, which focuses on the 11-12-year-old age group (Level 3) or very young children (7-8 years, Level 1) (Kardi, CS, Asri, et al., 2025). Specific research on the 8-11-year-old age range, covering multiple levels (Level 1 and Level 2), is very limited, even though this is a critical phase for children's motor and basic athletic development. Furthermore, previous studies have generally evaluated Kids' athletics programmes as a whole; none have examined the impact of specific events such as Slalom Switch, Okubuuka, and Kykkaa. Additionally, research on Kids' Athletics in Indonesia remains very limited and is generally conducted in Java. There is a lack of research examining the implementation of the kids' athletics programme in the context of Papua or eastern Indonesia, where cultural characteristics of movement and the condition of sports facilities may influence the outcomes of the intervention.

METHOD

Research Design

This study used a quasi-experimental method with a one-group pretest-posttest design. This design was chosen to measure the effect of treatment or intervention on the dependent variable by comparing the conditions before and after treatment in the same group.

Participants

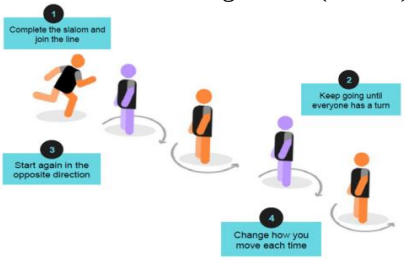
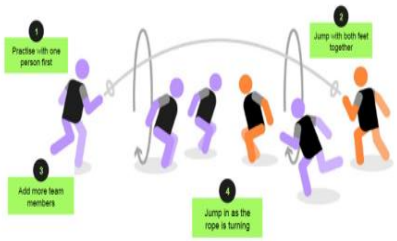
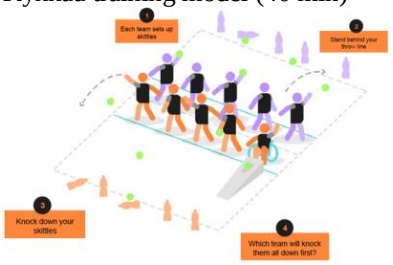
The sample in this study consisted of 40 children aged 8-11 years, namely students in grades 4-6 from an elementary school in Jayapura, Indonesia. The sampling technique used was purposive sampling with the criterion of children aged 8-11 years. Ethical approval was obtained from the Institutional Review Board, and informed consent was obtained from participants' parents or guardians.

Table 1. Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
Students aged 8-11 years	Students outside the 8-11 age range
In good health and fit to exercise	Sick or injured
Have parental permission	Do not have parental permission
Willing to participate in the entire training programme (Slalom Switch, Okubuuka, Kykkaa)	Unwilling or unable to fully participate in the training programme
Completing all pretest and posttest series	Missing one or both tests (pretest/posttest)

Intervention Procedures

Table 2. 12-Week Training Session with a Frequency of 3 Times/Week

Week	Tuesday	Wednesday	Friday
1-12	Warming up 12 minutes: 1. Jogging around a 30m x 30m field by running across the diagonal line each lap (5 minutes) 2. Static and dynamic stretching (7 minutes) Slalom Switch training model (40 min):  Intensity: Week 1-4: 65% Week 5-8: 75% Week 9-12: 85% Cool Down (10 minutes) Stretching the body from the neck joint to the toes	Warming up 12 minutes: 1. Jogging around a 30m x 30m field by running across the diagonal line each lap (5 minutes) 2. Static and dynamic stretching (7 minutes) Okubuuka training model (40 min):  Intensity: Week 1-4: 65% Week 5-8: 75% Week 9-12: 85% Cool Down (10 minutes) Stretching the body from the neck joint to the toes	Warming up 12 minutes: 3. Jogging around a 30m x 30m field by running across the diagonal line each lap (5 minutes) 4. Static and dynamic stretching (7 minutes) Kykkaa training model (40 min)  Intensity: Week 1-4: 65% Week 5-8: 75% Week 9-12: 85% Cool Down (10 minutes) Stretching the body from the neck joint to the toes

The Slalom Switch training model is designed in the form of a fun game that incorporates basic motor skills. Slalom Switch training is designed as a team game. Each team consists of 5 students who take turns performing slalom movements around their teammates. The procedure for the Slalom Switch training model is as follows: (i) Line up in a single team formation, (ii) Spread out so that there is approximately 2 metres between each student. (iii) Take turns to complete the slalom around your teammates, (iv) When one student reaches the end, join the line, (v) Once all students have had their turn, start again from the opposite direction,

changing the movement pattern each time: walking, jogging, sprinting; side steps; backward walking; starting to the left first or starting to the right first. Physical skills to be developed: agility, balance, rhythm of movements, spatial orientation; mixed: sprints, shuttle runs, running with barriers.

The Okubuuka training model is tailored as a fun game to play and helps strengthen basic motor skills. The Okubuuka training exercise is a team game and involves 6 students: two students as rope spinners and four students to jump over the rope. Procedure for the Okubuuka training model: two plate spinners and members start to jump into the rope or just run in. Now the members have started entering the game. Start counting. The physical skills that students can acquire from training on the Okubuuka model are balancing, body and muscle size rhythm during movement, reflexes, and reactive movements. Athletic skills for the Okubuuka training model include high jump or vertical jump.

The Kykkaa training model is designed in the form of a fun game that incorporates basic motor skills. Kykkaa training is designed as a team game consisting of five students per team. The procedure for the Kykkaa training model is as follows: (i) Set up two throwing lines and two bottle or cone lines, 5-10 metres away from each throwing line; 10 tennis balls; and 10 bottles or cones, (ii) The two teams stand facing away from each other, with each team positioned behind the designated throwing line, (iii) Students throw the tennis balls and attempt to knock down the bottles or cones, (iv) If a team runs out of balls, the team captain retrieves them and returns to the throwing line. The team that knocks down all the bottles first wins.

Instruments

The research instrument used was the Indonesian Student Fitness Test (TKSI) developed by the Ministry of Education and Culture for Phase C elementary school students, which included a hand-eye coordination test (child ball test) with validity = 0.511 and reliability = 0.494 (moderate); an accuracy test (tok tok ball test) with validity = 0.376 and reliability = 0.524 (moderate); an abdominal muscle strength test (move the ball test) with validity = 0.472 and reliability = 0.508 (moderate); an agility test (shuttle run 8 x 10 m test) with validity = 0.376 and reliability = 0.524 (moderate); and a cardiovascular endurance test (600 m run test) with validity = 0.545 and reliability = 0.490 (moderate) (Kemdikbud RI, 2024).

Data Analysis

There are three stages of analysis in a quasi-experimental research design. The first stage is data preparation, which means the data will be properly formatted, organised, and cleaned of errors and outliers. Second, the assumptions of the collected data are tested (prerequisites) using normality and homogeneity tests. To assess the differences in the impact of implementing the pre-test and post-test training models, a paired t-test was conducted by looking at the effect size and confidence interval values using the SPSS version 29.0 application. Third, the results are compiled and presented in tables and diagrams. A comparison of the pretest and posttest results was conducted to examine whether there were differences before and after implementing the Kids Athletics training methods, which include the Slalom switch, Okubuuka, and Kykkaa training methods.

RESULTS AND DISCUSSION

This study involved 40 elementary school students who received Kids Athletics Level 2 training models, namely the slalom switch, okubuuka, and kykkaa training models. The characteristics of the research subjects showed good homogeneity with an average age of 10.9 ± 1.8 years, height of 143.3 ± 5.2 cm, and weight of 36.7 ± 4.3 kg.

Table 3. Comparison of Pretest and Posttest Scores

Variable	Pretest Mean ± SD	Posttest Mean ± SD	t	Cohen's d	CI 95%	p
Child Ball Test - Coordination (score)	7.00 ± 1.50	11.00 ± 1.20	5.29	2.94	2.81, 5.19	0.003
Tok-Tok Ball Test - Accuracy (score)	1.00 ± 0.80	4.00 ± 1.10	4.11	3.12	2.16, 3.84	0.004
Move the Ball Test - Strength (repetitions)	7.00 ± 1.20	12.00 ± 1.50	6.04	3.68	3.81, 6.19	0.001

Variable	Pretest Mean ± SD	Posttest Mean ± SD	t	Cohen's d	CI 95%	p
Shuttle Run 8 × 10 m Test - Agility (second)	33.17 ± 2.30	30.15 ± 1.90	3.65	1.43	1.17, 4.87	0.002
600 m Run Test - Endurance (seconds)	331.2 ± 12.40	290.1 ± 10.80	4.82	3.53	30.91, 51.29	0.002

Based on the data analysis in **Table 3**, the results obtained are that the mean coordination score increased from 7.00 ± 1.50 to 11.00 ± 1.20. This 4-point improvement was statistically significant (t = 5.29; p = 0.003). A Cohen's d value of 2.94 indicates a very large effect size, suggesting that the intervention had a strong impact on improving motor coordination. The 95% confidence interval (2.81-5.19) confirms that this improvement was consistent and not due to chance. The mean accuracy score also increased significantly, from 1.00 ± 0.80 to 4.00 ± 1.10 (t = 4.11; p = 0.004). Cohen's d = 3.12 represents the second-largest effect size in this study, reflecting a very strong impact of the intervention on accuracy performance. The 3-point improvement, with a 95% confidence interval (2.16-3.84), indicates strong consistency of the results. The strength variable showed the most prominent statistical improvement, increasing from 7.00 ± 1.20 to 12.00 ± 1.50 repetitions (t = 6.04; p = 0.001, the smallest p-value in the study). Cohen's d = 3.68 is the largest among all variables, indicating that the strongest intervention effect occurred in the strength component. The 95% confidence interval (3.81-6.19) further reinforces the practical significance of these findings. Completion time decreased from 33.17 ± 2.30 seconds to 30.15 ± 1.90 seconds, indicating that participants became faster and more agile following the intervention. This 3.02-second reduction was statistically significant (t = 3.65; p = 0.002). Cohen's d = 1.43 is considered a large effect size, although relatively smaller compared to the other variables, possibly because agility involves more complex neuromuscular components and may require a longer training duration to achieve substantial changes. The 600 m completion time decreased markedly from 331.2 ± 12.40 seconds to 290.1 ± 10.80 seconds, indicating a highly significant improvement in cardiorespiratory endurance. This ~41-second reduction was statistically significant (t = 4.82; p = 0.002), with Cohen's d = 3.53, representing a very large effect size. The 95% confidence interval (30.91-51.29) indicates that the magnitude of improvement is both clinically and practically meaningful.

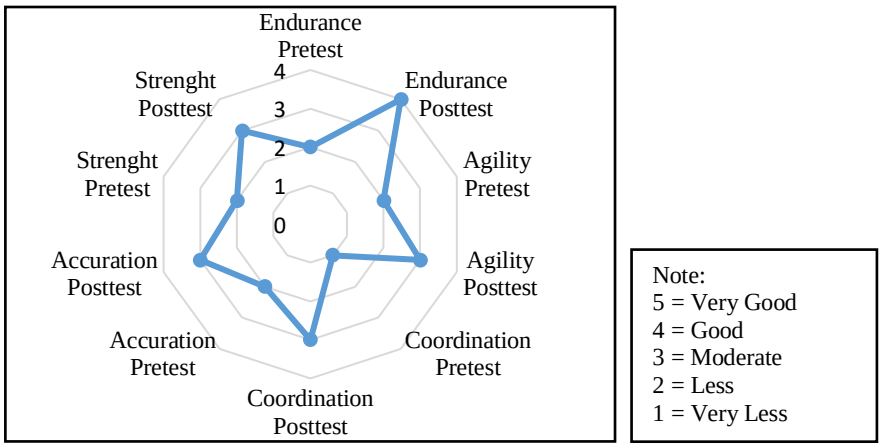


Figure 4. Diagram of Students' Skill Improvement

The study results show that the Slalom Switch, Okubuuka, and Kykkaa training models significantly increase the endurance capacity of children aged 8 to 11 years. Meanwhile, the principles of child athletic development state that youths must develop fundamental movement skills before sports specialisation (World Athletics, 2024). Training models used thoroughly during the experimental period are used to assess the aerobic capacity and anaerobic power of the participating children. The study on kids athletics using primary school students on physical fitness and motivation enables students to learn the relevance of sports and, at the same time, assists them in advancing their fitness and performance in sports (Petros et al., 2016). Consistent with a study that suggested that students who underwent the kids athletics training model developed high

physical skills (Jakubík & Broďáni, 2023). According to Jakubík and Broďáni, "kids athletics training model clearly developed the studied students' physical skills significantly, especially in sports." (Kardi, CS, Ibrahim, et al., 2025).

The previous assessment yielded a percentage increase of 15.25%. This finding is consistent with the Athletics Australia findings based on the training records of children aged 10 years to 16 years who have a history of a minimum of 12 months of experience in fundamental movement skills (Athletics Australia, 2023). The opportunity for improvements in endurance for children between the ages of 8 and 11 years is of utmost importance due to the fact that this is the decisive period when the cardiovascular system becomes the basis for an athletic future. Specifically, the training model under consideration is Future Training Incorporated, which is based on LTAD, the long term athlete development, which prioritises multilateral development preceding unilateral specialisation (Ford et al., 2011). This complies with the youth sports trainer principal who also proposes general athleticism to take place over sport-specific skills up until the age of 12 (Gostomski, 2023).

The improvement in agility skills was highly significant, with an increase of 10.23% over 8 weeks after the Slalom Switch, Okubuuka, and Kykkaa training model implementation. One of the reasons for the significant improvement was the nature of the Slalom Switch training model, specifically intended to develop change of direction and reactive agility, critical aspects of developing a child's athleticism. Children show significant improvements in these areas through slalom because it involves multidirectional movements that force the children's neuromuscular systems to adapt to highly variable and numerous changes in direction and speed. This can be understood by considering physical education as a platform to instruct motor skills, which can complement most training models accessible in the developmental phases that follow, such as student agility (Lloyd et al., 2015). Additionally, it is stressed that young agility can be taught, albeit in various training models (Thieschäfer & Büsch, 2022). A study done by Elite Athlete Training Services illustrates that agility training programmes that take a holistic approach to the training history, age, and distinctive athletic requirements lead to better improvements in agility. The training model's exercise training will facilitate a proper stimulus to develop children's proprioceptive awareness and their reactive ability. Thus, it can be established that the training model will develop acceleration (Kurnaz et al., 2024).

The Okubuuka and Kykkaa training models helped enhance the coordination of the participants in the study. All sports activities require the basic ability of coordination as complex movements are performed. Under coordination that was improved are interlimb coordination, bilateral coordination, and eye-hand coordination, which are vital to Kids' Athletics Level 2. The Commission on Accreditation of Athletic Training Education 2022 has similarly documented the ability of structured and progressive training to improve neuromuscular coordination in 8 to 11-year-old children (CAATE, 2022). The training models show appropriate stimuli that are required for the central nervous system to gain control and proficiently perform the coordination of complex movements. The children perform movements with greater control and efficiency, which is important. The 8 to 11-year-old children are in what is termed the golden age because the nervous system is highly plastic and responsive to coordination training stimuli, which greatly aids the development of motor coordination (Abhaydev et al., 2020).

Implementing the three training models led to considerable improvements in precision. Specifically, the Kykkaa model was crucial in developing precision due to its emphasis on goal-orientated, target-attribute movements. The improvement in precision involved visual-motor integration and fine motor control, both of which are essential in many sports. The findings are consistent with the training for young athletes in India, which emphasises movement training aimed at significantly developing precision (Athletics Federation of India, 2024). The models used sufficient repetition with variation to maximise motor control and learning (Kurnaz et al., 2024). Enhanced precision positively fosters self-efficacy in the execution of skills (Zhou et al., 2021). The ability to perform accurately significantly increases intrinsic motivation and the desire to train. This is consistent across the literature, and Kumar captures this succinctly (Kumar et al., 2017).

The training approach used in this study achieved an impressive 50% increase in all dimensions and relative strength in children, particularly in functional strength and relative strength, which are very vital to the athletic development of children aged 8-11 years. Previously, it was documented that students participating in a well-

structured strength training programme of 8 to 12 weeks documented 30%-50% gains in their strength, which supports my claim formulated in the study (Dahab & McCambridge, 2009). Specifically, during the given period, an increase in strength was traced to neuromuscular adaptations through motor unit recruitment and intermuscular coordination (Garcia-Retortillo et al., 2023). Support for the current study, based on the designed comprehensive training programme, strengthens the position that it can increase children's functional strength safely and effectively (Moreno-Torres et al., 2025). As specified in the study, the exercise model provided as resistance was in accordance with safe strength training guidelines for children. This development is a key indicator, as strength lies in the foundation for the development of all other physical components for the sport (Faigenbaum, 2000).

CONCLUSION

Based on the results of the study, it can be concluded that the implementation of the slalom switch, okubuuka, and kykkaa training methods has a significant effect on improving kids' athletics Level 2 skills in children aged 8-11 years. This is evidenced by the five variables tested, all of which showed p-values < 0.05 with large effect sizes (Cohen's d). Therefore, the slalom switch, okubuuka, and kykkaa training methods have proved to be effective and feasible to be applied as movement-based learning models in physical education programmes as well as in early-age athletic development.

Based on the results and conclusions of the study, several recommendations can be proposed as follows: For physical education teachers and coaches, it is recommended to adopt the slalom switch, okubuuka, and kykkaa training methods as part of athletic learning programmes at the elementary school level, considering that these three methods have been proven to comprehensively enhance fundamental movement components. For schools and sports institutions, it is necessary to provide facilities and infrastructure that support the implementation of this multilateral movement-based training model so that its benefits can be optimally experienced by all students. For future researchers, it is recommended to conduct similar studies by including a control group in order to strengthen the internal validity of the research, as well as to expand the sample size so that the findings can be more broadly generalised.

This study has several limitations that should be considered when interpreting the results and generalising the findings, including the absence of a control group in the research design. This study employed a pre-experimental design (one-group pretest–posttest design) without a comparison group; therefore, it cannot fully rule out the possibility that the observed improvements were influenced by other factors beyond the intervention, such as natural growth (maturation effect) or learning experiences outside the programme. The limited sample size. The sample size used in this study was relatively small; thus, the level of representativeness and the generalisability of the findings to a broader population still require further investigation.

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CONFLICT OF INTEREST

There is no conflict of interest in the publication of this article. The document has been verified for plagiarism, and the authenticity check is deemed adequate, while the references used have been cited in accordance with existing scientific writing regulations.

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