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Enhancing Elementary Students' Motor Skills through a Game-Based Athletics Activity Model

Mat Sapta Robbi Akbar[1], Muhsana El Cintami Lanos[2*], Widya Handayani[3], Hikmah Lestari[4], Siti Ayu Risma Putri[5]

[1,2,3,4,5]Master's Program in Physical Education, Universitas PGRI Palembang. Indonesia

*Corresponding Author: Muhsana El Cintami, Lanos, e-mail: elcintami@univpgri-palembang.ac.id

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Abstract

Study purpose. This study aimed to examine the effect of the Game-Based Athletics Activity Model on improving the locomotor motor skills of elementary school students during Physical Education, Sports, and Health (PJOK) lessons.

Materials and methods. A one-group pretest–posttest design was used with 30 fifth-grade students selected through total sampling. Participants completed an eight-week Game-Based Athletics Activity Model program. Locomotor skills were assessed using the TGMD-3 locomotor subtest and analyzed using the Shapiro–Wilk and Wilcoxon signed-rank tests ($p < 0.05$).

Results. The findings revealed a significant improvement in students' locomotor motor skills following the intervention. The mean locomotor score increased from 9.83 (SD = 1.82) at pretest to 20.57 (SD = 1.22) at posttest. The Wilcoxon signed-rank test showed a statistically significant difference between pretest and posttest scores ($Z = -4.782$, $p < 0.001$), indicating that all participants demonstrated improved locomotor performance after completing the game-based athletics program.

Conclusions. The Game-Based Athletics Activity Model was effective in significantly improving the locomotor motor skills of elementary school students. These findings suggest that integrating athletics into structured game-based learning activities offers an engaging, developmentally appropriate, and effective instructional approach for enhancing fundamental movement skills in physical education.

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Keywords: Game-based athletics, Motor skills, Physical education, Elementary school.

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Introduction

Human development begins in the prenatal period and continues after birth through the progressive maturation of the motor system, which occurs in a gradual and sequential manner (Karadeniz et al., 2023). Motor skill development is influenced by continuous practice and

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movement experiences, which enable the central nervous system to adapt through neuroplasticity, involving structural and functional changes in neural pathways in response to learning and repeated practice (Shi & Feng, 2022; Malling et al., 2025). Motor skills are a fundamental component that supports an individual's ability to perform a wide range of physical activities (Ritonga et al., 2024). At the elementary school level, motor skills serve as the foundation for the development of more complex movement abilities, improved physical fitness, and students' active participation in a variety of physical activities and sports (Chaeroni et al., 2022).

Physical education plays a strategic role in facilitating motor skill development through structured, systematic, and developmentally appropriate movement experiences (Sackett & Edwards, 2019; Syaflin et al., 2021; Pradipta et al., 2023; Lanos, 2024). Various instructional approaches have been developed and implemented to improve gross motor skills in physical education (Ericsson & Karlsson, 2012; Zhao et al., 2024; Magistro et al., 2022; Nazari et al., 2025). Gross motor skills are essential because they support students' ability to perform daily activities while contributing to their overall physical and motor development.

The development of motor skills among elementary school students remains a challenge in physical education. Preliminary observations conducted during Physical Education, Sports, and Health (PJOK) lessons in a fifth-grade class at SD Negeri 1 Talang Kelapa, Banyuasin, revealed that many students experienced difficulties in performing combinations of fundamental movement skills, including running, jumping, changing direction, and maintaining balance during physical activities. The learning process was predominantly characterized by conventional technique-based practice that emphasized repetitive movement drills. Consequently, students' engagement and active participation in the learning process remained suboptimal.

To address these challenges, a Game-Based Athletics Activity Model was developed by integrating fundamental athletics movements into structured play-based learning activities that are aligned with children's developmental characteristics. Athletics was selected because its core activities represent complementary domains of fundamental movement skills running and jumping as locomotor skills and throwing as an object-control skill providing a logical progression from whole-body locomotor control toward more complex object maniplation and coordination (Duncan et al., 2019). Consequently, athletics instruction at the elementary school level should emphasize enjoyable and developmentally appropriate game-based experiences rather than repetitive technical drills. Such an approach is expected to increase students' learning motivation, promote active participation, and facilitate the development of fundamental motor skills in accordance with their stage of growth and development (Fahmi et al., 2026). The model was designed to create an active, enjoyable, and student-centered learning environment that promotes greater student engagement throughout the learning process. By integrating running, jumping, and throwing into a variety of structured game-based activities, the model provides richer and more diverse movement experiences than conventional technique-based instruction. These varied movement stimuli are expected to optimize the development of students' motor skills while simultaneously fostering motivation, active participation, and meaningful learning experiences (Jakubík & Broďáni, 2023; Kardi & Cs, 2025).

The Game-Based Athletics Activity Model comprises five structured games Sprint Bendera Nusantara, Estafet Kilat Ceria, Reaksi Petir Sprint, Lintasan Ninja Sprint, and Sprint Juara Mini that progressively integrate running, jumping, coordination, and complementary throwing-and-catching tasks to develop students' locomotor skills. However, empirical evidence regarding its effectiveness in improving elementary school students' motor skills remains limited. Previous studies have primarily focused on the model development and validation process rather than evaluating its impact on students' motor skill outcomes. This

research gap highlights the need for further investigation to determine whether the developed model effectively enhances motor skill development. Therefore, this study addresses the need for further empirical evidence on structured and progressive game-based athletics interventions by examining a five-game model designed to improve locomotor skills among elementary school students (Sun, 2024; Yin et al., 2025).

Materials and methods

Type of Research

A one-group pretest–posttest experimental design was employed, whereby all participants received the same intervention and outcomes were assessed before and after the intervention without the inclusion of a control group (Priadana, & Sunarsi, 2021). Motor skill performance was assessed before (pretest) and after (posttest) the intervention to determine changes attributable to the treatment. All participants received the same intervention through the implementation of the Game-Based Athletics Activity Model. This design was considered appropriate for evaluating the preliminary effectiveness of an educational intervention in an authentic school setting, particularly when the inclusion of a control group was not feasible because of limited participant availability or ethical considerations (Creswell, J. W., & Creswell, 2017).

Study participants

The study was conducted at SD Negeri 1 Talang Kelapa, Banyuasin Regency, South Sumatra, Indonesia, involving 30 fifth-grade students aged 10–11 years who were selected through total sampling.

The inclusion criteria were as follows: (1) active enrollment in the fifth grade, (2) regular participation in Physical Education, Sports, and Health (PJOK) classes, (3) good physical health, (4) written informed consent from parents or legal guardians, and (5) willingness to participate in all stages of the study. Students with musculoskeletal or neurological disorders, those who sustained injuries during the study period, or those who did not complete both the pretest and posttest assessments were excluded from the data analysis.

All study procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki, ensuring participant safety, data confidentiality, and the right to withdraw from the study at any time without affecting participation in regular school activities (Association, 2013).

Study organization

Research Procedures

The study was conducted over an eight-week period and consisted of four phases: preparation, pretest, intervention, and posttest. The preparation phase included the development of instructional materials, expert validation of the Game-Based Athletics Activity Model, preparation of the research instruments, and coordination with the school and physical education teachers. Baseline motor skills were then assessed using the Test of Gross Motor Development–Third Edition (TGMD-3).

The intervention comprised eight instructional sessions, each lasting 2 × 35 minutes. Each session included a warm-up, game-based athletics activities, and a cool-down with reflection. The learning activities were progressively organized from simple to more complex tasks to facilitate the development of locomotor skills in accordance with the developmental characteristics of elementary school students.

Following the intervention, participants completed a posttest using the same TGMD-3 instrument and standardized assessment procedures as those used during the pretest, allowing changes in motor skill performance to be evaluated objectively.

Research Instrument

Motor skill performance was assessed using the Test of Gross Motor Development–Third Edition (TGMD-3), developed by Motor skill performance was assessed using the Test of Gross Motor Development–Third Edition (TGMD-3) developed by Ulrich (2019). The TGMD-3 is an internationally recognized standardized assessment instrument for evaluating fundamental movement skills in school-aged children and has demonstrated strong construct validity, reliability, and internal consistency across diverse child populations. (Ulrich, 2019 ; Hulteen et al., 2020 ; Zhu et al., 2025). The TGMD-3 comprises two subtests: Locomotor Skills and Ball Skills (Object Control). This study employed only the Locomotor Skills subtest, as it corresponds to the focus of the Game-Based Athletics Activity Model, which is designed to develop fundamental locomotor skills through athletics-based activities.

Table 1. TGMD-3 Instrument Components

Domain	Skill	Assessment Purpose
Locomotor	Running	To assess the ability to run with proper coordination and technique.
Locomotor	Galloping	To assess coordination during the galloping movement pattern.
Locomotor	Hopping	To assess the ability to hop on one foot while maintaining balance and coordination.
Locomotor	Skipping	To assess coordination during the skipping movement pattern.
Locomotor	Horizontal Jump	To assess the ability to perform a standing horizontal jump with appropriate technique.
Locomotor	Sliding	To assess the ability to perform coordinated lateral sliding movements.

Table 2. TGMD-3 Locomotor Skills Scoring Criteria

Score	Scoring Criteria
1	Performance criterion correctly demonstrated.
0	Performance criterion not correctly demonstrated.

Participants were provided with a demonstration of each movement by the examiner and allowed one practice trial. Each participant then performed two test trials for every locomotor skill. Each performance criterion was scored as **1** if executed correctly according to the TGMD-3 guidelines and **0** if the criterion was not met. Scores from the two trials were summed to obtain the score for each skill, and the skill scores were subsequently aggregated to produce the total locomotor score. Higher total scores indicated better locomotor motor skill performance (Ulrich, 2019).

The assessments were conducted by two trained examiners who were familiar with the TGMD-3 administration and scoring guidelines. To enhance the objectivity of the assessments, an observer calibration session was conducted before data collection to ensure scoring consistency. Any discrepancies between the examiners' scores were resolved through discussion until a consensus was reached.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize the data, including the mean, standard deviation (SD), minimum and maximum values, and 95% confidence intervals (95% CI). Prior to hypothesis testing, data normality was assessed using the Shapiro–Wilk test, as the study sample comprised fewer than 50 participants (Field, 2018). Differences between the pretest and posttest scores were analyzed using a paired-samples *t*-test when the data met the assumption of normality. When this assumption was violated, the Wilcoxon signed-rank test was used as the non-parametric alternative.

In addition to significance testing, the effect size (Cohen's *d*) was calculated to determine the magnitude of the effect of the Game-Based Athletics Activity Model on students' motor skill improvement. The magnitude of the effect size was interpreted according to the following thresholds: trivial (0.01), small (0.20), medium (0.50), large (0.80), very large (1.20), and extremely large (2.00) (Sawilowsky, 2009). Seluruh analisis statistik dilakukan pada taraf signifikansi p < 0,05. Statistical significance was set at $p < 0.05$ for all analyses.

Results

A total of 30 fifth-grade students completed the study protocol, including the pretest, the eight-week implementation of the Game-Based Athletics Activity Model, and the posttest. No missing data were recorded, and all participants were included in the final analysis.

Descriptive statistics showed an improvement in the total raw scores of the TGMD-3 Locomotor Skills Subtest following the implementation of the Game-Based Athletics Activity Model. The mean score increased from 9.83 (SD = 1.82) at pretest to 20.57 (SD = 1.22) at posttest, representing a mean increase of 10.74 points. These raw scores were derived from the performance-criterion scores across the six locomotor skills assessed by the TGMD-3 and were used as the primary outcome measure because the intervention specifically targeted students' locomotor motor skills.

Table 3. Descriptive Statistics of Pretest and Posttest Scores

Variable	n	Mean	SD	Minimum	Maximum
Pretest	30	9.83	1.82	6	13
Posttest	30	20.57	1.22	18	23

All locomotor skill indicators demonstrated improved performance following the implementation of the Game-Based Athletics Activity Model.

Prior to hypothesis testing, the normality of the data was evaluated using the Shapiro–Wilk test because the sample size was fewer than 50 participants. The results were used to determine whether parametric or non-parametric statistical analyses were appropriate**.**

Table 4. Results of the Shapiro–Wilk Normality Test

Variable	W	p
Pretest	0.955	0.230
Posttest	0.923	0.032

The results of the Shapiro–Wilk normality test are presented in Table 4. The pretest scores were normally distributed ($W = 0.955$, $p = 0.230$), whereas the posttest scores deviated

significantly from a normal distribution (W = 0.923, p = 0.032). Because the normality assumption was not satisfied for the posttest data, differences between the pretest and posttest scores were analyzed using the Wilcoxon signed-rank test, a non-parametric test for paired samples. This approach ensured that the statistical analysis was appropriate for the distributional characteristics of the data.

Differences in locomotor motor skill scores before and after the implementation of the Game-Based Athletics Activity Model were analyzed using the Wilcoxon signed-rank test.

Table 5. Wilcoxon Signed-Rank Test: Rank Statistics

Ranks	n	Mean Rank	Sum of Ranks
Negative Ranks	0	0.00	0.00
Positive Ranks	30	15.50	465.00

All participants showed improved scores following the intervention, as evidenced by the presence of 30 positive ranks and the absence of both negative ranks and tied scores.

Tabel 6. Wilcoxon Signed-Rank Test Statistics

Statistik	Nilai
Wilcoxon Statistic (W)	0.00
Z	-4.782
Asymp. Sig. (2-tailed)	<0.001

The Wilcoxon signed-rank test revealed a highly significant difference between the pretest and posttest scores ($Z = -4.782$, $p < 0.001$). Therefore, the null hypothesis was rejected, indicating that the Game-Based Athletics Activity Model significantly improved the locomotor motor skills of elementary school students.

To further illustrate the changes in students' locomotor motor skill performance following the implementation of the Game-Based Athletics Activity Model, a comparison of the mean pretest and posttest scores is presented in Table 7.

Tabel 7. Comparison of Pretest and Posttest Locomotor Motor Skill Scores

Measurement	Mean (SD)	Mean Difference
Pretest	9.83 (1.82)	0.00
Posttest	20.57 (1.22)	10.74

The findings of this study demonstrated a significant improvement in elementary school students' locomotor motor skills following the implementation of the Game-Based Athletics Activity Model. The mean score increased from 9.83 (SD = 1.82) at pretest to 20.57 (SD = 1.22) at posttest. The Wilcoxon signed-rank test further confirmed that all participants achieved higher posttest scores than pretest scores, as indicated by 30 positive ranks ($Z = -4.782$, $p < 0.001$). These findings provide empirical evidence that the Game-Based Athletics Activity Model is effective in enhancing the locomotor motor skills of elementary school students.

Discussion

The findings of this study demonstrated a significant improvement in students'

locomotor motor skills following the implementation of the Game-Based Athletics Activity Model. The increase in the mean TGMD-3 locomotor score from 9.83 to 20.57 indicates improved locomotor performance after the eight-session intervention. This improvement may be explained by the repeated exposure to locomotor movement patterns embedded within the five game-based activities, which provided students with opportunities to practice running, jumping, changing direction, and coordinated movement in varied task contexts. Previous research has shown that game-based learning and gamification in physical education can enhance students' engagement and learning experiences (Camacho-Sánchez, 2023;Hasan et al., 2024), while game-based interventions have also demonstrated positive effects on children's motor skills (Muliadin et al., 2025) and systematically designed fundamental movement skill interventions can improve children's motor competence through developmentally appropriate and repeated movement experiences (Koolwijk et al., 2024;Yin et al., 2025).

The improvement can be further understood from the specific movement demands embedded in the five activities. Sprint Bendera Nusantara and Estafet Kilat Ceria provided repeated opportunities to perform running, acceleration, and coordinated arm leg actions, thereby reinforcing basic locomotor control. Reaksi Petir Sprint added rapid responses to auditory and visual stimuli, requiring students to initiate movement quickly and coordinate the transition from the starting position to sprinting. Lintasan Ninja Sprint introduced more complex locomotor demands by combining running with jumping, zig-zag movement, and obstacle negotiation, requiring balance, agility, spatial control, and coordinated changes in movement direction. Meanwhile, Sprint Juara Mini allowed students to integrate previously practiced running and starting skills in a simplified competitive context. These movement demands were consistent with the locomotor skills targeted by the TGMD-3, particularly running and jumping, while the variations in direction, balance, and coordination provided additional movement challenges that may have supported broader locomotor competence. This is consistent with (Apriyadi et al., 2026), who developed a game-based movement model that integrated running, jumping, and other fundamental movement skills through progressively structured games for elementary school students.

The repeated practice of these movement patterns within varied and meaningful game contexts may have facilitated motor learning by allowing students to repeatedly perform locomotor actions while adapting their movements to different task demands. This interpretation is consistent with evidence that structured and varied movement activities, including small-sided games and fundamental movement circuits, can enhance children's motor performance by providing diverse movement experiences and adaptive motor challenges (Priyambada et al., 2026). This interpretation is consistent with evidence that game-based physical education can enhance children's enjoyment and engagement (Mo et al., 2024), while structured and progressive motor activities can provide repeated movement challenges that support motor skill development (Septaliza et al., 2026). Fundamental movement skills also provide an important foundation for physical literacy and continued participation in physical activity (Piotrowski et al., 2025). Therefore, the improvement observed in the present study may be attributed not simply to the use of games, but to the systematic repetition and progressive variation of locomotor movements embedded within the Game-Based Athletics Activity Model.

Conclusions

This study concludes that the Game-Based Athletics Activity Model significantly improves the locomotor motor skills of elementary school students. By integrating athletics into a variety of game-based activities, the model provides active, engaging, and developmentally appropriate learning experiences that support the acquisition of fundamental locomotor skills. The significant differences observed between the pretest and posttest scores indicate that the

study objective of enhancing students' locomotor motor skills through the Game-Based Athletics Activity Model was successfully achieved.

This study contributes to the field of physical education by providing empirical evidence for a student-centered, game-based instructional approach to athletics that promotes the development of fundamental movement skills. Nevertheless, the findings should be interpreted in light of several limitations, including the use of a one-group pretest–posttest design and a relatively small sample size. Future research should employ randomized controlled or quasi-experimental designs, include larger and more diverse samples, and examine the effectiveness of the model across different educational levels and school contexts to strengthen the generalizability of the findings.

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Conflict of interest

The authors declare that there are no conflicts of interest related to the conduct, analysis, or publication of this study. The research was conducted independently without any financial, commercial, or personal influence that could have affected the study design, data collection, data analysis, interpretation of the findings, or preparation of the manuscript.

References

Apriyadi. A., Manullang, J. G., Imansyah, F., & Tambunan, G. K. (2026). The development of a basic motion learning model for elementary school students. Indonesian Journal of Physical Education and Sport Science, 6(1), 141–150. https://doi.org/10.52188/ijpess.v6i1.1952

Camacho-Sánchez, R., Manzano-León, A., Rodríguez-Ferrer, J. M., Serna, J., & Lavega-Burgués, P. (2023). Game-based learning and gamification in physical education: A systematic review. Education Sciences, 13(2), Article 183. https://doi.org/10.3390/educsci13020183

Chaeroni, A., Effendi, H., & Pranoto, N. W. (2022). Aplikasi pelatihan gerak dasar fundamental bagi siswa sekolah dasar. JASO: Jurnal Pengabdian Masyarakat Olahraga dan Kesehatan, 2(1). https://doi.org/10.24036/jaso.v2i1.10

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. SAGE Publications.

Duncan, M. J., Roscoe, C. M. P., Noon, M., Clark, C. C. T., O'Brien, W., & Eyre, E. L. J. (2020). Run, jump, throw and catch: How proficient are children attending English schools at the fundamental motor skills identified as key within the school curriculum? European Physical Education Review, 26(4), 814–826. https://doi.org/10.1177/1356336X19888953

Ericsson, I., & Karlsson, M. K. (2012). Motor skills and school performance in children with daily physical education in school: A 9-year intervention study. Scandinavian Journal of Medicine & Science in Sports. https://doi.org/10.1111/j.1600-0838.2012.01458.x

Fahmi, D. A., Herlambang, T., & Wiyanto, A. (2026). The impact of specialized equipment on motor skills and motivation in junior male artistic gymnasts. Indonesian Journal of

Physical Education and Sport Science, 6(1), 151–164. https://doi.org/10.52188/ijpess.v6i1.1953

Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th ed.). SAGE Publications.

Hasan, B., Husein, M., & Islam, S. (2024). Exploring traditional games with a literature review: How do they impact children's motor skills? Indonesian Journal of Physical Education and Sport Science, 4(4), 442–452. https://doi.org/10.52188/ijpess.v4i4.809

Hulteen, R. M., Barnett, L. M., True, L., Lander, N. J., del Pozo Cruz, B., & Lonsdale, C. (2020). Validity and reliability evidence for motor competence assessments in children and adolescents: A systematic review. Journal of Sports Sciences. https://doi.org/10.1080/02640414.2020.1756674

Jakubík, J. Á. N., & Broďáni, J. (2023). Influence of kids' athletics and athletic movement games on the development of general physical performance of pupils in primary education. Journal of Physical Education and Sport, 23(1), 219–228. https://doi.org/10.7752/jpes.2023.01027

Karadeniz, S., Suveren, C., Arslan, Y., Ayyıldız Durhan, T., Ceylan, T., Albay, F., Küçük, H., & Ceylan, L. (2024). Examination of basic motor skills in children and adolescents. Frontiers in Physiology, 14, Article 1346750. https://doi.org/10.3389/fphys.2023.1346750

Kardi, I. S., Ansar, C. S., Ibrahim, Alimuddin, & Nopiyanto, Y. E. (2025). Enhancing multi-skill development in 6–7-year-olds through the "Crocodile River," "Socorro," and "Meo Duoi Chuot" games in the kids' athletics level 1 program. Journal Sport Area, 10(2), 166–176. https://doi.org/10.25299/sportarea.2025.vol10(2).18995

Koolwijk, P., Hoeboer, J., Mombarg, R., Savelsbergh, G. J. P., & de Vries, S. (2024). Fundamental movement skill interventions in young children: A systematic review. International Journal of Sport and Exercise Psychology, 22(7), 1661–1683. https://doi.org/10.1080/1612197X.2023.2210597

Lanos, M. E. C., Handyani, W., Manullang, J. G., Winartiningsih, A., & Festiawan, R. (2024). Development of interactive manipulative motion learning media using Adobe Animate for elementary school students. Jurnal Keolahragaan, 12(2), 184–194. https://doi.org/10.21831/jk.v12i2.76328

Magistro, D., Cooper, S. B., Carlevaro, F., Marchetti, I., Magno, F., Bardaglio, G., & Musella, G. (2022). Two years of physically active mathematics lessons enhance cognitive function and gross motor skills in primary school children. Psychology of Sport and Exercise, 63, Article 102254. https://doi.org/10.1016/j.psychsport.2022.102254

Malling, M., Spedden, M. E., Christensen, M. S., & Lundbye-Jensen, J. (2025). Motor skill learning differentially modulates functional connectivity in cortical and corticospinal networks in children, adolescents, and adults. NeuroImage, 319, Article 121436. https://doi.org/10.1016/j.neuroimage.2025.121436

Mo, W., Saibon, J. B., Li, Y., Li, J., & He, Y. (2024). Effects of game-based physical education programs on enjoyment in children and adolescents: A systematic review and meta-analysis. BMC Public Health, 24, Article 517. https://doi.org/10.1186/s12889-024-18043-6

Muliadin, R., Satrawan, R., Fitriani, A., Furkan, & Irawan, E. (2025). The effect of the traditional game of Bola Nyawa on improving motor skills. Indonesian Journal of Physical Education and Sport Science, 5(3), 358–364. https://doi.org/10.52188/ijpess.v5i3.1317

Nazari, S., Norouzi, R., Hossini, S., Norouzi, E., & Manzano-Sánchez, D. (2025). Combined teaching games for understanding and sport education in PE can improve student emotion regulation, intrapersonal intelligence and psychomotor skills. Acta Psychologica, 261, Article 105812. https://doi.org/10.1016/j.actpsy.2025.105812

Piotrowski, T., Makaruk, H., Tekień, E., Feleszko, W., Kołodziej, M., Albrecht, K., Grela, K., Makuch, R., Werner, B., & Gąsior, J. S. (2025). Fundamental movement/motor skills as an important component of physical literacy and bridge to physical activity: A scoping review. Children, 12(10), Article 1406. https://doi.org/10.3390/children12101406

Pradipta, G. D., Suherman, W. S., Suhartini, B., Maliki, O., Widiyatmoko, F., Hudah, M., Yudhistira, D., Virama, L. O. A., Akhiruyanto, A., Hidayah, T., Paryadi, [inisial perlu dikonfirmasi], Purwanto, E., Putranto, D., Oktarina, [inisial perlu dikonfirmasi], & Naviri, S. (2023). Development of Si Buyung gymnastics-based motion learning model to improve students' basic motion skills: Aiken validity. International Journal of Human Movement and Sports Sciences, 11(2), 388–397. https://doi.org/10.13189/saj.2023.110216

Priadana, H. M. S., & Sidik, D. (2021). Metode penelitian kuantitatif. Pascal Books.

Ritonga, I., Gusril, G., Kiram, Y., Lanos, M. E. C., & Festiawan, R. (2024). Designing an innovative learning model for fundamental throwing and catching skills using the teaching games for understanding (TGfU) approach in elementary education. Retos, 61, 448–454. https://doi.org/10.47197/retos.v61.108823

Sackett, S. C., & Edwards, E. S. (2019). Relationships among motor skill, perceived self-competence, fitness, and physical activity in young adults. Human Movement Science, 66, 209–219. https://doi.org/10.1016/j.humov.2019.04.015

Sawilowsky, S. S. (2009). New effect size rules of thumb. Journal of Modern Applied Statistical Methods, 8(2). https://doi.org/10.22237/jmasm/1257035100

Septaliza, D., Endrawan, I. B., Susilonugroho, D., Aliriad, H., & Moh, L. (2026). Gamification-based adaptive physical education model for gross motor skills in students with intellectual disabilities. Indonesian Journal of Physical Education and Sport Science, 6(2), 426–439. https://doi.org/10.52188/ijpess.v6i2.2075

Shi, P., & Feng, X. (2022). Motor skills and cognitive benefits in children and adolescents: Relationship, mechanism and perspectives. Frontiers in Psychology, 13, Article 1017825. https://doi.org/10.3389/fpsyg.2022.1017825

Sun, S., & Chen, C. (2024). The effect of sports game intervention on children's fundamental motor skills: A systematic review and meta-analysis. Children, 11(2), Article 254. https://doi.org/10.3390/children11020254

Syaflin, H. M., Nurdin, F., Widiastuti, Syafaruddin, Lanos, M. E. C., & Syaflin, S. L. (2021). Basic locomotor motion characteristic design using games model for elementary school student. International Journal of Human Movement and Sports Sciences, 9(3), 560–567. https://doi.org/10.13189/saj.2021.090323

Ulrich, D. A. (2019). Test of gross motor development (3rd ed.). PRO-ED.

World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA, 310(20), 2191–2194. https://doi.org/10.1001/jama.2013.281053

Yin, X., Zhang, D., Shen, Y., Wang, Y., Wang, Z., & Liu, Y. (2025). Effectiveness of school-based interventions on fundamental movement skills in children: A systematic review and meta-analysis. BMC Public Health, 25(1), Article 1522. https://doi.org/10.1186/s12889-025-22696-2

Zhao, H., Deng, Y., Song, G., Zhu, H., Sun, L., & Li, H. (2024). Effects of 8 weeks of rhythmic physical activity on gross motor movements in 4–5-year-olds: A randomized controlled trial. Journal of Exercise Science & Fitness, 22, 456–462. https://doi.org/10.1016/j.jesf.2024.10.001

Zhu, Y., Wang, J., Ding, Y., Qian, Y., Korivi, M., Chen, Q., & Ye, W. (2025). Assessing the measurement properties of the Test of Gross Motor Development-3 using the COSMIN

methodology: A systematic review. Behavioral Sciences, 15(1), Article 62. https://doi.org/10.3390/bs15010062

Information about the authors:

Mat Sapta Robbi Akbar,: saptarobby12@gmail.com, https://orcid.org/0009-0009-8964-0007 , Master's Program in Physical Education, Universitas PGRI Palembang. Indonesia

Muhsana El Cintami Lanos,: elcintami@univpgri-palembang.ac.id, https://orcid.org/0000-0002-6409-5112 , Master's Program in Physical Education, Universitas PGRI Palembang. Indonesia

Widya Handayani,: Widyahandayani@univpgri-palembang.ac.id, https://orcid.org/0000-0001-5006-5249 , Master's Program in Physical Education, Universitas PGRI Palembang. Indonesia

Hikmah Lestari,: hik2mah@gmail.com, https://orcid.org/0000-0002-9615-264 , Master's Program in Physical Education, Universitas PGRI Palembang. Indonesia

Siti Ayu Risma Putri: ayurisma@univpgri-palembang.ac.id, https://orchid.org/0009-0008-3372-7093 , Master's Program in Physical Education, Universitas PGRI Palembang. Indonesia

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