



The Effect of FMS Based Soccer Training on Elementary School Students' Gross Motor Skills

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Abstract

This study aims to determine the effect of Fundamental Movement Skills (FMS) based soccer extracurricular training on the improvement of gross motor skills in 9–10 year old elementary school students in Bandung Regency. The study employed a quasi experimental design with a quantitative approach. The sample consisted of 30 students selected using purposive sampling. The instrument used was the Test of Gross Motor Development-3 (TGMD-3), which measures locomotor and manipulative skills. The FMS-based training program was delivered in a structured manner through movement activities such as running, jumping, balancing, dribbling, and kicking a ball. The results of the study indicate that FMS based training has a positive effect on students' gross motor skills. In the locomotor aspect, the horizontal jump and run skills were rated as excellent. In the manipulative aspect, the kicking skill showed the highest results compared to other skills. Overall, FMS-based soccer extracurricular training was able to improve elementary school students' movement coordination, balance, agility, and object control. A structured training program tailored to children's developmental stages was deemed effective for supporting Physical Education learning and early age sports development.

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INTRODUCTION

Physical Education, Sports, and Health in elementary schools plays a strategic role in developing students' motor skills, physical fitness, as well as positive attitudes and values. Structured and purposeful physical education activities can support the development of motor skills from an early age (Ciencias et al., 2025). PJOK aims to develop various aspects of students' health, physical fitness, critical thinking, emotional stability, social skills, and moral values through physical activities and sports (Pelana, 2014). During elementary school, children are in the foundational motor development phase, which significantly determines their motor skills in later years. Childhood is a critical stage in motor development because gross and fine motor skills during this phase significantly influence future motor development (Mao et al., 2022). Gross motor skills such as running, jumping, maintaining balance, and movement coordination form the primary foundation for children to effectively engage in various sports activities.

However, the reality of implementing Physical Education and Health in elementary schools reveals various limitations, particularly regarding the relatively limited allocation of instructional time. Inadequate mastery of fundamental movement skills (FMS) during childhood can lead to low levels of physical activity, difficulties in mastering movements, and an increase in sedentary behavior among children (Khudolii et al., 2025). Physical education classes, which are typically held only once a week, are considered insufficient to provide students with optimal and sustained movement experiences. Suboptimal mastery of fundamental movement skills (FMS) can hinder the development of motor skills in subsequent stages (Triansyah & Gustian, 2020). This condition results in poor mastery of basic motor skills, such as locomotor, non-locomotor, and manipulative skills, which should develop systematically during elementary school age.

Developing FMS in children is crucial to align with developmental stages to support future physical activity and sports (Utoyo et al., 2021). One activity that supports students' gross motor development is soccer as an extracurricular activity. Fundamental movement skills (FMS) are generally accepted as the primary foundation for mastering specific sports skills, including in soccer (Kokstejn & Musalek, 2019). Soccer is a sport that simultaneously involves locomotor, non-locomotor, and manipulative movements, making it highly effective in training children's physical and motor abilities. Research indicates a strong relationship between fundamental movement skills and specific soccer skills in young players (Kokstejn & Musalek, 2019). However, in practice, soccer extracurricular activities in elementary schools often emphasize direct gameplay without considering the developmental stages of students' basic movement skills. As a result, many students still struggle with basic movements such as running with good coordination, maintaining balance, and controlling body movements while playing.

In response to these limitations, sports extracurricular activities have become a strategic alternative to enrich students' motor learning experiences. Sports extracurriculars can provide additional practice time, opportunities for skill repetition, and a more flexible and varied learning environment (Bailey, 2006). Soccer extracurriculars are among the most popular activities among elementary school students because they are fun, competitive, and involve various forms of physical activity. However, in practice, the implementation of soccer extracurricular training in elementary schools is often more focused on mastering game techniques and achieving short-term performance goals, without considering the principles of children's motor development.

Recent studies indicate a global decline in FMS proficiency, which may impact children's long-term physical fitness and health (Piotrowski et al., 2025). FMS are considered the "building blocks" or foundational elements for the development of more complex and specific motor skills (Idamokoro et al., 2020). Therefore, Fundamental Movement Skills (FMS) are essential movement patterns that serve as the foundational " " for more complex motor skills and physical activities. These skills are crucial for children's physical, cognitive, and social development, and form the basis for lifelong physical activity and health (O'Brien et al., 2023). A training approach that overemphasizes soccer-specific techniques risks neglecting students' fundamental needs in developing Fundamental Movement Skills (FMS). Children with strong

FMS tend to be more physically active, possess higher self-confidence, and demonstrate better performance in structured sports activities (Lubans et al., 2010). FMS encompasses basic movement skills that serve as the primary prerequisite for children's success in performing various physical activities and sports. An imbalance between sports technique training and FMS development can result in students' movement skills developing suboptimally, and may even risk creating motor skill disparities among students.

Soccer training is considered one of the effective methods for developing fundamental movement skills in children (Mao et al., 2022). Therefore, a soccer extracurricular training model is needed that is systematically designed and aligned with the developmental characteristics of elementary school students specifically, training based on *Fundamental Movement Skills*. The development of students' gross motor skills through soccer extracurricular activities is inextricably linked to the mastery of Fundamental Movement Skills (FMS). Research shows that structured soccer training significantly improves locomotor and object control components in children (Mao et al., 2022). The integration of FMS into soccer training serves as a crucial foundation for mastering more complex sports techniques and acts as a medium for stimulating optimal gross motor development (Fadhli & Bagus, 2026).

Previous research has shown that soccer training programs for school-aged children can improve students' motor skills and basic techniques. However, the effectiveness of such programs is greatly influenced by training design, frequency, intensity, and the quality of instruction. These findings align with the (Côté & Vierimaa, 2014), which states that participation in sports must be supported by a learning environment appropriate to the child's developmental stage.

The implementation of soccer-based extracurricular exercises grounded in *Fundamental Movement Skills* is expected to serve as a solution for enhancing elementary school students' gross motor skills. Through structured exercises such as zig-zag running, one-legged hopping, balance exercises, and manipulative activities with a ball, students will receive more varied movement stimuli that are appropriate for their developmental stage. In line with this, (Juliarta et al., 2025) found that soccer drills conducted in a structured, progressive manner and accompanied by clear instruction can significantly improve elementary school students' passing skills and motor coordination. Therefore, an extracurricular soccer training approach based on Fundamental Movement Skills is considered relevant for improving elementary school students' gross motor skills. Consequently, students' gross motor skills can develop optimally, which will ultimately also support their ability to perform basic soccer techniques.

The difference between soccer training based on Fundamental Movement Skills (FMS) and conventional soccer training lies in the training approach, which places greater emphasis on developing children's basic movement abilities. Fundamental Movement Skills (FMS)-based training is designed to develop locomotor, non-locomotor, and manipulative skills through movement activities appropriate for the developmental stage of elementary school students. Meanwhile, conventional soccer training generally focuses more on mastering game techniques such as passing, dribbling, and shooting. Thus, the FMS approach is considered more suitable for elementary school students because it builds a strong foundation of movement before students master more complex soccer skills.

Furthermore, the FMS-based training approach aligns with the principles of Physical Education that emphasize gradual, enjoyable, and age-appropriate movement development for elementary school-aged children. Good gross motor skill development not only impacts athletic ability but also daily activities, self-confidence, and students' active participation in learning.

Based on the above discussion, research is needed on the effect of soccer extracurricular training based on Fundamental Movement Skills on the improvement of gross motor skills in elementary school students. This study is expected to contribute to the development of a more effective, systematic, and age-appropriate extracurricular training model, thereby enhancing the quality of Physical Education instruction and early-age sports development in elementary schools.

METHOD

This study employs a quantitative research design using a quasi-experimental method to address the research problem: determining the level of gross motor skills among elementary school students participating in soccer extracurricular activities in Bandung Regency. The problem was addressed through direct measurement of students' gross motor skills using standardized instruments. The results of the measurements were then analyzed quantitatively to determine the categories of students' gross motor skill levels. The population in this study consisted of active elementary school students in Bandung Regency, with a sample of 30 students aged 9–10 years selected using purposive sampling based on the alignment of sample characteristics with the research objectives.

The research instrument used was the Test of Gross Motor Development-3 (TGMD-3), which measures gross motor skills through two subtests: locomotor skills and manipulative skills (ball skills). Each skill was assessed based on performance criteria, with a score of 1 if the criteria were met and a score of 0 if they were not met. The use of the TGMD-3 in this study aimed to obtain objective, measurable data on gross motor skills that align with the developmental characteristics of 9 to 10 year old children.

The measurement data were analyzed using quantitative descriptive analysis with percentage techniques to group students' gross motor skill levels into specific categories. The stages of the testing process in this study included the preparation stage, the test administration stage, and the data recording stage. The entire data collection process was conducted systematically to ensure that the measurement results obtained could objectively describe the participants' gross motor skills. **Table 1.** presents the TGMD-3 test norms used as a reference in classifying students' gross motor skill levels.

Table 1. TGMD Test Norms

Score	Category	Index
17–20	Gifted or Highly Advanced	>129
15–16	Superior	120–129
13–14	Above average	110–119
8–12	Average	90–109
6–7	Below Average	80–89
4–5	Borderline (Impaired or Delayed)	70–79
1–3	Impaired or delayed	<70

Source: Dale A. Ulrich (2019)

Data collection for the TGMD-3 in this study was conducted in accordance with the norms established in the TGMD-3 instrument. Each skill item was assessed twice: during the first trial and the second trial. From these two trials, the student's best score was used as the basis for assessment to describe the gross motor skills of soccer extracurricular students in Bandung Regency. Subsequently, the total scores obtained were analyzed to determine the participants' gross motor skill levels, and the corresponding percentages were calculated to classify achievement levels quantitatively. This study employed a quantitative descriptive analysis technique using a percentage-based approach. The calculation process was conducted using Microsoft Excel to obtain the frequency distribution and percentages for each category of gross motor skills. Research conclusions were drawn after all data were organized, processed, and thoroughly analyzed in the research report. Percentage-based descriptive analysis was performed using an adjusted formula to describe the distribution and trends of the data quantitatively.

RESULTS AND DISCUSSION

This study aimed to determine the effect of soccer-based *Fundamental Movement Skills* (FMS) extracurricular training on the improvement of gross motor skills in 9 to 10 year old elementary school students in Bandung Regency. Gross motor skills were measured using the TGMD-3 instrument, which consists of locomotor skills and object control (manipulative) skills. Prior to the pre- -post-test, students were provided with a structured FMS-based soccer extracurricular training program over several sessions. *Fundamental Movement Skills* are basic

movement skills that serve as a crucial foundation for children's motor development and support the mastery of more complex sports skills (Webster & Ulrich, 2017).

The study sample consisted of 30 students. Data analysis was conducted using descriptive percentage analysis and interpretation of average skill scores. The results of the study indicate that FMS-based soccer extracurricular training produces a positive improvement in the gross motor skills of elementary school students.

Table 2. TGMD-3 Gross Motor Skills Test Results: Locomotor Skills

Skill	Item	Score 0 (F)	Score 0 (%)	Score 1 (F)	Score 1 (%)	Average	Notes
Run	I.1	6	20	24	80	0.825	Very Good
	I.2	8	27	22	73		
	I.3	3	10	27	90		
	I.4	4	13	26	87		
Gallop	I.5	10	33	20	67	0.733	Good
	I.6	8	27	22	73		
	I.7	9	30	21	70		
	I.8	5	17	25	83		
Hop	I.9	3	10	27	90	0.750	Good
	I.10	8	27	22	73		
	I.11	11	37	19	63		
	I.12	8	27	22	73		
Skip	I.13	10	33	20	67	0.767	Very Good
	I.14	7	23	23	77		
	I.15	4	13	26	87		
Horizontal Jump	I.16	0	0	30	100	0.833	Very Good
	I.17	10	33	20	67		
	I.18	9	30	21	70		
	I.19	1	3	29	97		
Slide	I.20	9	30	21	70	0.717	Good
	I.21	12	40	18	60		
	I.22	10	33	20	67		
	I.23	3	10	27	90		

Table 3. Results of the TGMD-3 Gross Motor Skills Test: Manipulative Skills

Skill	Item	Score 0 (F)	Score 0 (%)	Score 1 (F)	Score 1 (%)	Average	Description
Two-Hand Strike of Stationary Ball	I.1	20	67	10	33	0.407	Moderate
	I.2	18	60	12	40		
	I.3	15	50	15	50		
	I.4	17	57	13	43		
	I.5	19	63	11	37		
Forehand Strike of Self-Bounce Ball	I.6	12	40	18	60	0.442	Moderate
	I.7	20	67	10	33		
	I.8	19	63	11	37		
	I.9	16	53	14	47		
One-Handed Stationary Dribble	I.10	6	20	24	80	0.678	Good
	I.11	12	40	18	60		
	I.12	11	37	19	63		
Two-Hand Catch	I.13	9	30	21	70	0.700	Good
	I.14	10	33	20	67		
	I.15	8	27	22	73		
Kick	I.16	0	0	30	100	0.858	Very Good
	I.17	6	20	24	80		
	I.18	5	17	25	83		
	I.19	6	20	24	80		
Overhand Throw	I.20	6	20	24	80	0.725	Good
	I.21	12	40	18	60		
	I.22	11	37	19	63		
	I.23	4	13	26	87		
Underhand Throw	I.24	4	13	26	87	0.708	Good
	I.25	12	40	18	60		
	I.26	12	40	18	60		
	I.27	7	23	23	77		

Based on the results of data analysis on locomotor skills, most students achieved ratings ranging from good to excellent. The skill with the highest average was the *Horizontal Jump* at 0.833, which was rated excellent. These results indicate that students were able to coordinate jumping movements well after participating in FMS-based training. Additionally, the *Run* skill achieved an average of 0.825, which falls into the "very good" category. This indicates an improvement in students' basic running coordination, body balance, and movement control.

For the *Gallop*, *Hop*, and *Slide* skills, the study results also showed a "good" category with averages of 0.733, 0.750, and 0.717, respectively. These findings indicate that FMS-based training can gradually improve students' locomotor abilities through varied and repetitive movement activities.

Furthermore, regarding manipulative skills, the research results showed that the *Kick* skill achieved the highest average score of 0.858, falling into the "very good" category. These results indicate that students were able to effectively coordinate kicking movements after participating in soccer training based on *Fundamental Movement Skills* (FMS).

However, not all manipulative skills showed equally high results. The *Two-Hand Strike of a Stationary Ball* skill achieved an average score of 0.407, and the *Forehand Strike of a Self-*

Bounce Ball skill achieved 0.442, both falling into the moderate category. These results indicate that students still struggle with coordinating the striking movements, which require precise timing, concentration, and simultaneous eye-hand coordination.

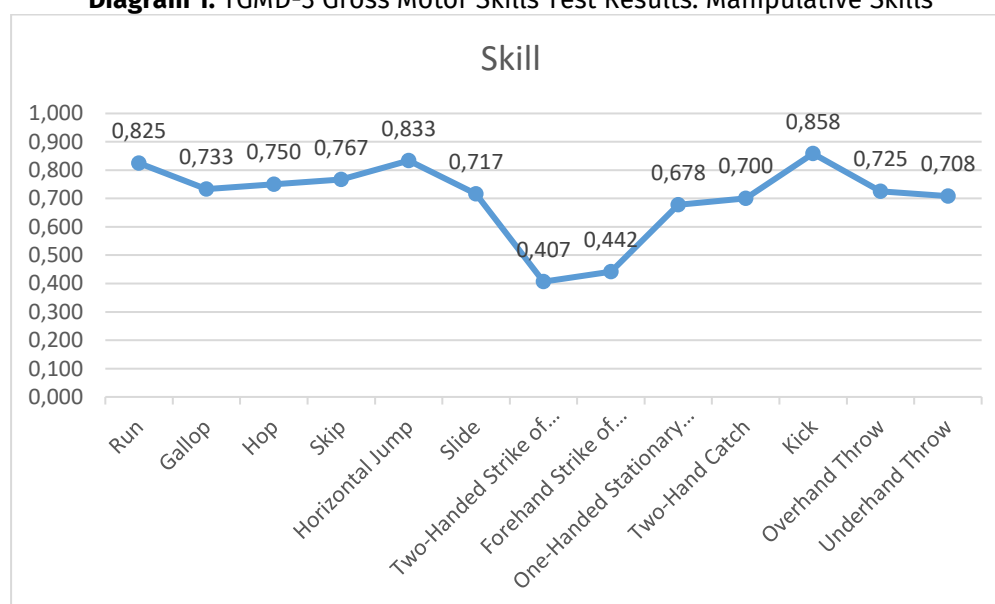
Meanwhile, other manipulative skills such as *the Two-Hand Catch*, *Overhand Throw*, and *Underhand Throw* fell into the good category, with averages ranging from 0.700 to 0.733. Overall, the research results indicate that FMS-based soccer extracurricular training has a positive impact on improving students' gross motor skills, although certain manipulative skills still require more intensive and sustained practice.

Table 3. TGMD-3 Gross Motor Skills Test Results: Manipulative Skills

Average Score	Category
0.00–0.25	Low development (Poor)
0.26–0.50	Moderate (Average)
0.51–0.75	Good
0.76–1.00	Very Good

Overall, the results of the study indicate that FMS-based soccer extracurricular training has a positive effect on improving the gross motor skills of elementary school students. This improvement is evident in both locomotor and manipulative abilities, which developed into the good to very good categories following the training intervention.

Diagram 1. TGMD-3 Gross Motor Skills Test Results: Manipulative Skills



The research results indicate that FMS-based soccer extracurricular training has a positive effect on improving the gross motor skills of elementary school students. This finding is evident from the improvement in students' locomotor abilities and object control (manipulative) skills, which fell into the good to very good categories after participating in the training program.

The improvement in gross motor skills in this study occurred because FMS-based training provided movement stimuli appropriate for the developmental characteristics of elementary school-aged children. Soccer training has a positive influence on the development of children's *fundamental movement skills* (Mao et al., 2022). Activities such as running zig-zagging, jumping, maintaining balance, dribbling, and kicking a ball involve various basic movement components that are crucial for children's gross motor development. Repetitive

and structured training helps students improve movement coordination, balance, agility, and body control.

Regarding locomotor skills, the research results indicate that the *Horizontal Jump* and *Run* skills achieved an “excellent” rating. This finding suggests that FMS-based training can enhance students’ basic movement abilities, particularly in movements requiring lower-body strength, body coordination, and balance. These findings align with the view that FMS serves as the primary foundation for developing more complex movement skills in elementary school-aged children. FMS is a fundamental element in the development of more complex sports skills, including soccer skills (Koksteijn et al., 2019) . Children with good mastery of locomotor skills tend to find it easier to participate in sports activities and have higher levels of physical activity.

Additionally, research findings on manipulative skills indicate that *kicking* ability scored the highest compared to other skills. This may occur because kicking the ball is a dominant component of soccer training, leading students to receive more frequent repetitions of the movement during practice. Continuous repetition of movements can help improve students’ eye-foot coordination and object control abilities.

The FMS-based soccer extracurricular training in this study also provided a more enjoyable and varied movement learning experience compared to conventional training that focuses solely on game techniques. The FMS approach emphasizes not only game outcomes but also considers the stages of children’s motor development. Consequently, students have the opportunity to optimally develop their basic motor skills before mastering more complex sports techniques.

The findings of this study reinforce previous research stating that soccer training based on *Fundamental Movement Skills* is effective in improving the gross motor skills of elementary school children. A training program designed according to children’s developmental stages can enhance basic movement skills while simultaneously supporting sports technique development more effectively.

Although the research results show significant improvement, the development of students’ gross motor skills still needs to be carried out continuously through structured training, appropriate training intensity, and a positive learning environment. The roles of coaches, physical education teachers, and schools are crucial in creating extracurricular activities that can stimulate students’ motor development comprehensively.

CONCLUSION

Based on the research findings, it can be concluded that soccer-based extracurricular training using *Fundamental Movement Skills* (FMS) has a positive impact on improving the gross motor skills of 9 to 10 year old elementary school students in Bandung Regency. Improvements in gross motor skills were observed in the areas of locomotor skills and manipulative skills, which fell into the good to very good categories following the FMS-based training program.

Locomotor skills such as *Run* and *Horizontal Jump* showed excellent results, while in manipulative skills, the highest score was obtained in the *Kick* skill. These results indicate that FMS-based soccer training is capable of improving students’ movement coordination, balance, agility, and object control more optimally.

Thus, FMS-based soccer extracurricular training can serve as an effective alternative training model for enhancing the gross motor skills of elementary school students. A structured, varied, and developmentally appropriate training program is crucial for optimally supporting Physical Education learning and early-age sports development.

REFERENCES

- Bailey, R. (2006). Physical education and sport in schools: A review of benefits and outcomes. *Journal of School Health*, 76(8), 397–401. <https://doi.org/10.1111/j.1746-1561.2006.00132.x>
- Ciencias, I. D., Educación, D., Enseñanza, D. D., & Ed, D. (2025). [Judul artikel tidak lengkap/hilang]. *Nama Jurnal*, 11(Oktober), 1–24.
- Côté, J., & Vierimaa, M. (2014). The developmental model of sport participation: 15 years after its first conceptualization. *Science & Sports*, 29, 1–15. <https://doi.org/10.1016/j.scispo.2014.08.133>

- Fadhli, N. R., & Bagus, D. (2026). Analisis kemampuan motorik kasar pemain sepak bola U-10 dengan TGMD-3. *Jurnal Olahraga Rekreasi (JOR)*, 6(1), 214–226. <https://doi.org/10.38048/jor.v6i1.6751>
- Idamokoro, M., Pienaar, A. E., Gerber, B., & Van Gent, M. M. (2020). Positive effects of a 9-week programme on fundamental movement skills of rural school children. *Nama Jurnal*, 1–15.
- Juliarta, A., Efendi, D., Aliriad, H., Da, M., & Febriansyah, A. (2025). Drill-based movement learning: An experimental study of elementary school children's soccer passing skills. *Nama Jurnal*, 565–574.
- Khudolii, M., Ivashchenko, O., & Khudolii, O. (2025). Fundamental movement skills development in children aged 5–12: Theory, evidence, and pedagogical models. *Physical Education Theory and Methodology*, 25(6), 1456–1470. <https://doi.org/10.17309/tmfv.2025.6.16>
- Kokstejn, J., & Musalek, M. (2019). The relationship between fundamental motor skills and game specific skills in elite young soccer players. *Journal of Physical Education and Sport (JPES)*, 19(1), 249–254. <https://doi.org/10.7752/jpes.2019.s1037>
- Kokstejn, J., Musalek, M., Wolanski, P., Murawska-Cialowicz, E., & Clemente, F. M. (2019). Fundamental motor skills mediate the relationship between physical fitness and soccer-specific motor skills in young soccer players. *Frontiers in Physiology*, 10(May), 1–9. <https://doi.org/10.3389/fphys.2019.00596>
- Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents: Review of associated health benefits. *Sports Medicine*, 40(12), 1019–1035. <https://doi.org/10.2165/11536850-000000000-00000>
- Mao, X., Zhang, J., Li, Y., Cao, Y., Ding, M., Li, W., & Fan, L. (2022). [Judul artikel tidak lengkap/hilang]. *Frontiers in Pediatrics*, (December), 1–17. <https://doi.org/10.3389/fped.2022.1019150>
- O'Brien, W., Khodaverdi, Z., Bolger, L., Murphy, O., Philpott, C., & Kearney, P. E. (2023). Exploring recommendations for child and adolescent fundamental movement skills development: A narrative review. *International Journal of Environmental Research and Public Health*, 20(4), Artikel 3278. <https://doi.org/10.3390/ijerph20043278>
- Pelana, R. (2014). Fun learning management for physical education, sport and health. *Asian Social Science*, 10(5), 85–90. <https://doi.org/10.5539/ass.v10n5p85>
- 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), 1–21. <https://doi.org/10.3390/children12101406>
- Triansyah, A., & Gustian, U. (2020). Penggunaan permainan tradisional untuk meningkatkan keterampilan gerak fundamental siswa Sekolah Dasar. *Nama Jurnal*, 16(1), 78–91.
- Utoyo, S., Juniarti, Y., Sari, N., & Mangge, K. (2021). Pendidikan jasmani untuk anak usia dini: Pengembangan fundamental movement skill (FMS) pada anak. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 5(1), 404–413. <https://doi.org/10.31004/obsesi.v5i1.605>
- Webster, E. K., & Ulrich, D. A. (2017). Evaluation of the psychometric properties of the Test of Gross Motor Development—Third Edition. *Journal of Motor Learning and Development*, 45–58.