



The effectiveness of physical fitness training on basic movement skills in supporting the habits of great Indonesian children

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ABSTRACT

This study examined the effectiveness of a structured physical fitness program in improving fundamental movement skills (FMS) and supporting the habits great Indonesian children profile. A quasi-experimental one-group pretest-posttest design was conducted on 37 elementary school students. Data were obtained from three FMS assessments (agility running, standing long jump, target throwing) and the habits of great Indonesian children questionnaire, which measures daily physical activity, healthy lifestyle, and positive character traits. Statistical analysis using SPSS version 22 included tests for normality and homogeneity, paired-sample t-tests, and effect sizes (Cohen's d). The results showed significant improvements across all FMS domains, with large effect sizes ($d = 0.70-0.95$). Integrated analysis with the habits of great Indonesian children revealed that most students were in the high category for daily physical activity (70%), healthy lifestyle (68%), and positive character traits (75%). These findings suggest that game-based fitness training not only improves motor competence but also promotes healthy behavior and character development. This study provides empirical support for incorporating structured physical fitness training into the elementary school curriculum and informs educational policies aimed at promoting holistic child development.

Key words: Character education; elementary school children; fundamental movement skills; healthy lifestyle habits; motor development; physical fitness training.

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INTRODUCTION

Physical fitness plays a fundamental role in shaping healthy lifestyle habits from an early age, with broad implications for public health and educational outcomes. Regular physical activity improves cardiorespiratory efficiency, muscular strength, and bone density while reducing the long-term risk of metabolic and cardiovascular diseases (Fernandes et al., 2016). Optimal physical development not only enhances physiological health but also supports learning effectiveness, attention span, and overall motor coordination (Wahyudi et al., 2018). Consequently, improving children's physical fitness represents a strategic investment in both the advancement of education and the development of Indonesia's human resources (Priadana & Suwandi, 2023; Wibowo & Pranata, 2020).

A substantial body of literature has established that structured physical activity positively influences children's cognitive, effective, and motor outcomes.

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Children who engage regularly in organized fitness programs demonstrate improved concentration, academic performance, and motor competence compared to their less active peers (Donnelly et al., 2016; Janssen & LeBlanc, 2015). In alignment with these findings, the Indonesian education policy emphasizes character-based learning grounded in Pancasila values to foster moral integrity and an active lifestyle (Kustiono et al., 2018). However, sustainable behavioral change and the cultivation of positive habits require systematic interventions that integrate physical, cognitive, and social dimensions from early childhood (Harni & Tarjiah, 2018). Physical fitness training, when designed appropriately, provides a platform for developing both physical competence and moral character, aligning with the national vision of the Great Indonesian Children (Anak Indonesia Hebat) initiative.

Despite this, many Indonesian children continue to exhibit low mastery of Fundamental Movement Skills (FMS), primarily due to insufficient daily physical activity and limited access to structured, enjoyable, and age-appropriate exercise programs (Mujriah et al., 2022). FMS comprising locomotor (running, jumping), non-locomotor (balancing, stretching), and manipulative (throwing, catching, dribbling) abilities serve as the cornerstone of motor development (Gallahue, 2012; Norito et al., 2022; Setyawan et al., 2022). Mastery of these skills contributes to children's physical, cognitive, and socio emotional growth (Barnett et al., 2016; Mahendra, 2017; Norito et al., 2019, 2022), increased PA, implicitly supports the prevention of long-term health risks (such as obesity and cardiovascular disease), because high PA is a major protective factor (Engel et al., 2018).

From a neuromuscular and motor control standpoint, structured strength and power training promotes specific physiological adaptations that underpin improved movement competence in children and adolescents. These targeted interventions enhance the Peak Rate of Force Development (PRFD) and Peak Force (PF), both of which are vital for optimizing performance in fundamental tasks such as isometric strength, the Squat Jump (SJ), and the Countermovement Jump (CMJ) (Lloyd et al., 2021). Complementary coordination-based exercises, including technology-assisted methods like virtual reality, further contribute to motor precision and throwing accuracy by enhancing neuromotor organization and refining intra- and intermuscular coordination. These adaptations collectively reduce movement variability and improve kinematic efficiency, leading to smoother, more controlled execution of fundamental movement patterns (López Rodríguez & Cancela-Carral, 2025).

Building on motor development theory, these physiological and coordinative gains directly support the acquisition and refinement of Fundamental Movement Skills (FMS) the foundation of lifelong physical activity. According to the proficiency barrier model, FMS competence and physical activity are mutually

reinforcing: children who demonstrate higher motor proficiency are more likely to participate in active play and sports, while those with limited skills often experience withdrawal and reduced confidence (Logan et al., 2018). Consequently, structured interventions that simultaneously enhance neuromuscular capacity and motor learning serve as critical mechanisms for overcoming this developmental barrier. By integrating strength, coordination, and task-specific practice, such programs not only improve physical performance but also foster sustained engagement in movement, thereby promoting long term motor development and health-oriented behaviors.

Play-based physical fitness training serves as an effective medium for developing motor competence while fostering exploration, adaptability, and intrinsic motivation. These characteristics enhance motor learning retention and facilitate skill transfer to everyday movement contexts. Empirical studies support these effects: plyometric and coordination-based programs enhance agility, balance, and object control (Franco et al., 2023; Gkintoni et al., 2024), and game-oriented motor training reduces sedentary behavior while improving fundamental movement proficiency (Landwehr & Kolip, 2021). Collectively, these findings confirm that enjoyable, game-based interventions effectively promote both physical fitness and sustained engagement in active, health-oriented lifestyles.

The novelty of this study lies in the implementation of a systematically designed, game based physical fitness training program within the Indonesian elementary school context. This approach not only targets improvements in fundamental motor skills but also nurtures positive habits and character values, aligning with the Great Indonesian Children framework. Therefore, this research aims to evaluate the effectiveness of structured physical fitness training in enhancing elementary school students' FMS, providing empirical evidence for the mechanisms of change linking physical training, neuromuscular adaptation, and holistic child development.

This study aims to analyze the effectiveness of physical fitness training in improving elementary school students' fundamental movement skills, while addressing the persistent physical fitness deficiencies (Makbullah et al., 2018). Early physical inactivity has been linked to an increased risk of chronic diseases, such as obesity, diabetes, and cancer (Kamal & Zulkifli, 2019). Therefore, elementary school is considered a crucial period for developing motor skills and establishing lifelong physical activity habits, which can only be achieved through effective teaching methodologies (Rink & Hall, 2008). Physical fitness interventions have been shown to improve children's physical abilities, coordination, and balance, particularly through gross motor skills such as walking, running, jumping, throwing, and catching (Hui et al., 2024). By comparing pretest and posttest results, program effectiveness can be objectively

evaluated, underscoring the importance of systematically designed interventions to support regular exercise habits at school.

Furthermore, this study contributes to a deeper understanding of the relationship between physical fitness and elementary school children's fundamental movement skills in Muara Bulian, while highlighting the importance of optimal training parameters. Although fundamental movement skills are recognized as the foundation of long-term physical activity, understanding of the factors contributing to their decline remains limited ([Tompsett et al., 2014](#)). [Butler et al., \(2020\)](#) emphasized that mastery of these skills requires direct instruction and practice, yet their implementation in physical education in schools remains suboptimal. Therefore, this study is expected to provide empirical evidence regarding the effectiveness of game-based fitness training in improving children's fundamental movement skills, as well as offer practical recommendations for developing a physical education curriculum that balances physical, motor, and character-building aspects. Socially, these findings also support national policies in developing a healthy, active, and character-based young generation in Indonesia.

METHOD

This study implemented physical fitness training while considering the characteristics and needs of children, ensuring that the activities provided were both enjoyable and varied. The training encompassed all components of physical fitness, from aerobic exercise to muscle strength, and was packaged in a game like format. Previous research confirms that a variety of activities can increase children's motivation and help them achieve their fitness goals ([Wick et al., 2017](#)). This aligns with the findings of [Wang and Zhou \(2024\)](#) motor development-focused exercise training has been shown to be significantly more effective in improving preschool children's gross motor skills compared to ordinary physical activity, underscoring the importance of systematic and continuously monitored exercise design.

This study implemented a structured physical fitness training program designed to align with the developmental characteristics and interests of children, ensuring the activities were both enjoyable and pedagogically meaningful. The intervention covered all major components of physical fitness including aerobic endurance, muscular strength, agility, balance, and coordination delivered through a game-based format to maintain motivation and engagement ([Wick et al., 2017](#)). Each session consisted of three phases: warm-up (8-10 minutes), core exercises (25-35 minutes), and cool-down (5-7 minutes). The main activities included lower-body strength training (e.g., squat jumps 3×10 reps), agility ladder drills (4×30 seconds), and target-throwing practice (4×8 throws with feedback). Intensity was maintained at a moderate

level based on children's Rate of Perceived Exertion (RPE 5-6), with weekly progression in task complexity. The detailed 10-week session manual including content, progression, and teacher role is available as an appendix.

The program was conducted once a week for ten weeks with 37 elementary school students (aged 11 years), selected using a total sampling technique to ensure representativeness and minimize selection bias. The decision to implement a once-per-week schedule was based on school timetable constraints; however, the study recognizes this as a significant limitation, as previous research suggests that optimal neuromuscular and coordination adaptations typically require a frequency of at least two to three sessions per week (Zebis et al., 2017). Future studies are therefore recommended to apply a randomized controlled trial (RCT) or cluster-randomized design with higher frequency and a suitable control group to better isolate causal effects.

This study also integrated the Habits of Great Indonesian Children framework, which includes seven core behavioral indicators promoted by the Ministry of Primary and Secondary Education: (1) waking up early, (2) praying, (3) exercising, (4) eating healthy and nutritious food, (5) liking to learn, (6) being social, and (7) going to bed early. Although not all seven habits were comprehensively assessed, this study used an instrument measuring three key domains: daily physical activity, healthy lifestyle habits, and positive character traits, through a parent-completed questionnaire. This limitation is acknowledged, and future research should incorporate additional observational indicators (e.g., peer interaction logs and teacher behavioral ratings) to provide a more comprehensive evaluation of behavior change.

To establish a logical link between training activities and targeted habits, this study developed a mapping matrix connecting specific exercise components to behavioral outcomes. For example, group-based agility drills foster teamwork and cooperative attitudes through shared goal achievement; repetitive strength and coordination tasks enhance self-discipline and persistence; throwing accuracy games cultivate focus and responsibility; and routine health-related exercise participation reinforces awareness of physical well-being.

The behavioral mechanisms underlying these outcomes align with experiential learning theory, which posits that repeated motor and social experiences gradually strengthen the cognitive-behavioral associations that support habit formation. Habits emerge when behaviors are consistently performed within similar contextual cues, reinforcing the linkage between stimulus and response. Through repeated practice, motor responses become increasingly automated and demand less cognitive effort, enabling the behavior to be sustained more efficiently and over longer periods (Grundmann et al., 2025).

Motor performance was assessed using standardized and validated Fundamental Motor Skills (FMS) tests: the agility run, standing long jump, and target throwing, previously validated in similar populations (Norito et al., 2019, 2022). The complete instrument set and protocol can be accessed at https://bit.ly/Instrumen_KD, ensuring transparency and reproducibility. To support the psychometric quality of the behavioral instrument, validity and reliability analyses were conducted. Content and construct validity were confirmed by three experts in physical education and developmental psychology, while internal consistency reliability achieved a Cronbach's α of 0.82, indicating high reliability. Nevertheless, potential perceptual bias in parental reporting is recognized as a methodological constraint; thus, future research should triangulate parental reports with direct behavioral observations and peer/teacher assessments.

Quantitative data analysis was performed using SPSS version 22. Normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) confirmed the data distribution, followed by paired t-tests ($\alpha = 0.05$) to determine significant pre- to post-intervention differences. The practical magnitude of change was calculated using Cohen's d to determine effect size (Cohen, 2013). Descriptive and inferential statistics are presented in tables and visual graphs for clarity. While the results indicate notable improvements in children's motor skills, causal interpretation should be made cautiously due to the absence of a control group. Therefore, this study should be viewed as a preliminary validation of a conceptual intervention model serving as a foundation for future controlled and longitudinal investigations into the link between physical fitness training, FMS enhancement, and behavioral development.

Following the assertion of Dobbins et al. (2013) that systematic evaluation and monitoring are essential for the success of physical activity programs, this study employed a quasi-experimental one-group pretest-posttest design involving thirty-seven elementary school students aged 11 years, selected using a total sampling technique. All eligible students from the target grade level participated to ensure comprehensive representation and minimize selection bias. The choice of 11-year-old participants was grounded in developmental theory, as this late childhood stage is a critical period for the acquisition of fundamental motor skills (FMS), which form the foundation for lifelong engagement in physical activity and character formation consistent with the Great Indonesian Children (AIH) framework. Over a ten-week intervention conducted once weekly, each session included structured warm-up, core training, and cool-down phases emphasizing agility, strength, and coordination through running, jumping, and throwing activities. The training content was adapted to participants' age, ability, and interest levels to enhance engagement and learning outcomes, aligning with the findings of Robinson et al. (2015) that

enjoyable, age-appropriate exercise programs have a stronger impact on motor competence and sustained participation

This study utilized a set of standardized and validated fundamental motor skills instruments agility run, standing long jump, and target throwing previously established in related research. The integrated instrument framework and measurement protocol, available at, enable replication and cross-validation in future studies. All participants completed both pre- and post-intervention assessments to objectively measure changes in motor performance, supported by the use of reliable and valid tools to ensure data accuracy and consistency (Janssen & LeBlanc, 2015). Complementary to these physical performance tests, direct observations were systematically conducted during each training session, and the Habits of Great Indonesian Children (AIH) questionnaire was distributed to parents to assess domains of daily physical activity, healthy lifestyle behaviors, and positive character traits. This combined approach provided a comprehensive understanding of how structured exercise influences both motor and behavioral outcomes. Furthermore, contextual variables such as parental involvement, school infrastructure, and environmental support were integrated into the analysis, consistent with King et al. (2020), who emphasize that effective program outcomes in physical activity interventions are shaped by the dynamic interplay between individual characteristics and their surrounding social-ecological systems.

FINDINGS AND DISCUSSIONS

Findings

The results of the Fundamental Movement Skills (FMS) test demonstrated a statistically and practically significant improvement across all three domains after students participated in the structured physical fitness training program. In the Agility Run, the mean completion time improved from 22.65 seconds to 20.78 seconds, representing a reduction of 1.87 seconds or approximately 12.6%. This improvement is considered practically substantial, reflecting enhanced agility and neuromuscular efficiency. According to Brusseau et al. (2020), a 10-15% improvement in agility performance among school-aged children indicates a meaningful enhancement in coordination and motor control, suggesting that the training effectively stimulated adaptations in movement precision, reaction speed, and lower limb responsiveness.

Similarly, the Standing Long Jump distance increased from 135.62 cm to 148.23 cm, an improvement of 12.61 cm (about 9.3%). This gain demonstrates a tangible increase in leg muscle power and force production capacity, likely resulting from improved recruitment of fast-twitch motor units and intermuscular coordination developed through repeated explosive activities such as jumping and sprinting drills. The finding supports Behm et al.(2017), who

emphasize that moderate-intensity plyometric and strength-oriented exercises can significantly enhance lower-limb strength and muscular endurance in children, contributing to better overall physical performance.

In the Target Throwing test, the average score increased from 21.63 to 26.11, reflecting a 20.7% improvement in throwing accuracy and control. This outcome signifies greater upper limb coordination, perceptual motor coupling, and fine motor precision key indicators of sensorimotor learning. Repeated throwing practice in a feedback-rich game environment has been shown to improve motor learning, accuracy, and coordination. This environment allows students to make perceptual adjustments (perceptual recalibration) and enhances kinesthetic awareness, significantly improving fundamental motor skills such as coordination and throwing accuracy.

Systematic and repetitive practice particularly when embedded in a game-based format has been shown to be highly effective in enhancing gross motor performance, reflecting meaningful gains in movement accuracy and control through structured sensorimotor conditioning (Cheong & Hussain, 2024). Consistent with this evidence, the observed improvements in motor coordination and throwing accuracy (Figure 1) demonstrate that the physical fitness intervention produced measurable and substantive enhancements in students' fundamental motor skills.

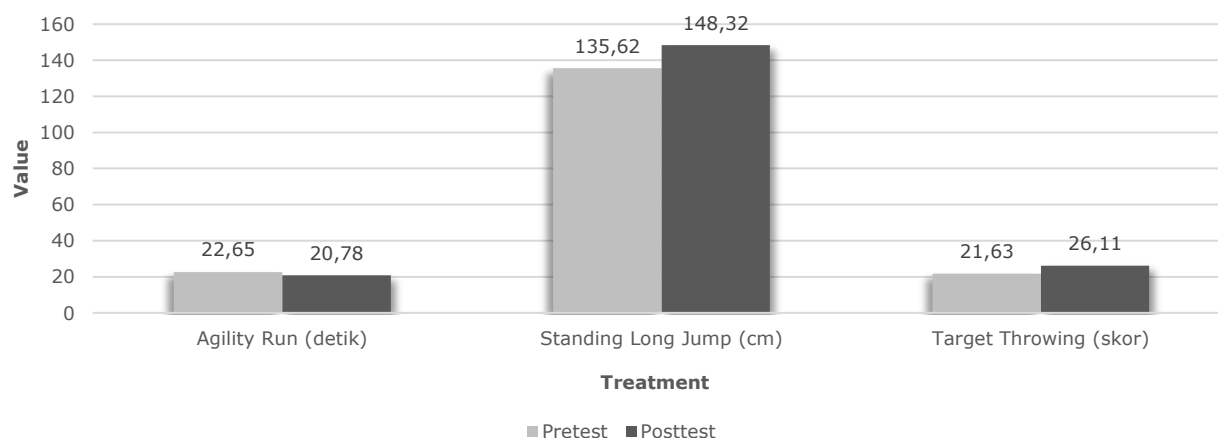


Figure 1. The results of comparision pretest dan posttest

The results of the study indicate a significant improvement in fundamental movement after participating in physical fitness training. which integrates the results of basic motor skills tests (Agility Run, Standing Long Jump, and Target Throwing). The following are the results of normality tests using the Kolmogorov–Smirnov tests in table 1.

Table 1. Normality test

Variables	Kolmogorov-Smirnov	df	Sig.
Agility Run Pre	.110	37	.200
Agility Run Post	.098	37	.200
Standing Long Jump Pre	.123	37	.124
Standing Long Jump Post	.115	37	.200
Target Throwing Pre	.130	37	.176
Target Throwing Post	.118	37	.200

The results of the normality test indicate that all basic movement skill variables have a significant value greater than 0.05. Thus, the data are normally distributed, thus fulfilling the assumptions for conducting a parametric test using a paired t-test as shown in Table 2 below.

Table 2. Paired t-test

Pair	Mean	Std. Dev	Std. Error Mean	t	df	Sig. (2-tailed)
Agility Run Pretest-Posttest	1.87	2.21	.36	5.20	36	.000
Standing Long Jump Pretest-Posttest	12.61	8.75	1.43	6.12	36	.000
Target Throwing Pretest-Posttest	4.48	6.21	1.02	4.40	36	.001

The results (Table 2) show statistically significant pretest to posttest differences across all three FMS domains: Agility Run ($t = -5.20$; $p = 0.000$), Standing Long Jump ($t = 6.12$; $p = 0.000$), and Target Throwing ($t = 4.40$; $p = 0.001$). Effect size analysis using Cohen's d further confirmed large practical effects ($d = 0.70-0.95$), signifying that the observed improvements were not only statistically significant but also meaningful in real-world educational and developmental contexts (Cohen, 2013).

From a practical perspective, these findings highlight that a relatively low-frequency intervention conducted once weekly over ten weeks was sufficient to produce measurable and educationally relevant gains in agility, strength, and coordination among elementary school students. The magnitude of improvement across FMS domains suggests that structured, game based physical fitness training can promote neuromuscular adaptation, enhance sensorimotor integration, and foster overall motor competence, all of which are fundamental for developing lifelong physical literacy and healthy habits.

These outcomes not only validate the intervention's effectiveness but also provide pedagogical implications for designing enjoyable, skill-oriented fitness programs that align with children's developmental needs and the Great Indonesian Children framework. Which indicates an increase in coordination skills and throwing accuracy. Based on these results, it can be statistically concluded that physical fitness training has a real impact on improving students'

basic movement skills significantly ($p < 0.05$). Furthermore, to determine the magnitude of the effect of physical fitness training interventions, Cohen's d was calculated in Table 3 below.

Table 3. Effect size (Cohen's d)

Variables	Cohen's d	Category
Agility Run	0.85	Strong
Standing Long Jump	0.95	Strong
Target Throwing	0.70	Medium-Strong

The results of the Effect Size analysis (Cohen's d) show that agility run has an effect of 0.85 (strong category), then standing long jump has an effect of 0.95 (strong category) and target throwing has an effect of 0.70 (medium-strong category) so that the Interpretation of Physical Fitness Training not only provides a statistically significant difference, but also has a fairly large practical impact on the basic motor skills of elementary school students. In addition, the integration of the results of the great Indonesian children questionnaire data supports the results of the statistical analysis in this study as shown in Figure 2.

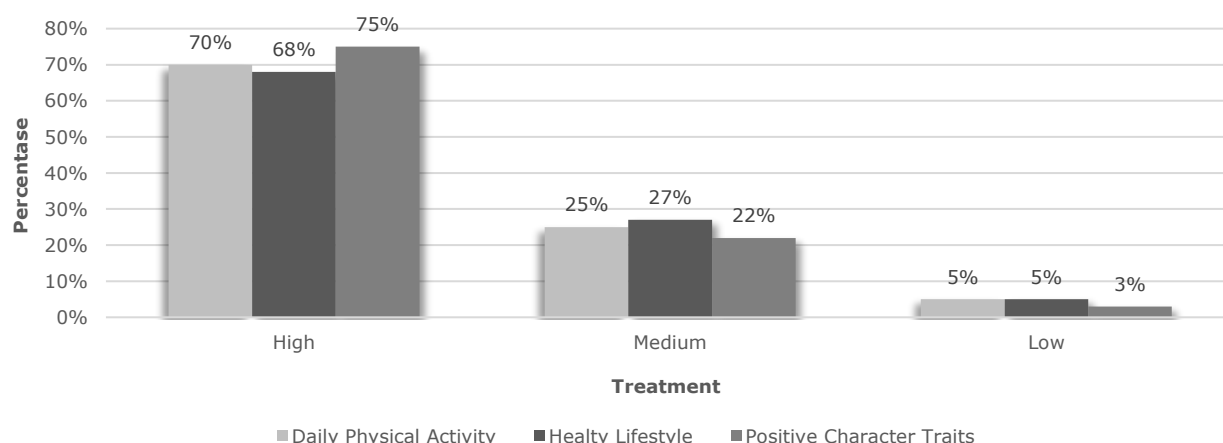


Figure 2. The results of comparison pretest dan posttest

The distribution depicting the great Indonesian children questionnaire with the percentage of students based on three assessment aspects as shown in Table 4: daily physical activity, healthy lifestyle, and positive character. As many as 70% of students are in the high category in daily physical activity, 68% of students are in the high category in healthy lifestyle, and 75% of students are in the high category in positive character. The percentage in the middle category ranges from 22-27%, while the low category is only 3-5%. This indicates that the improvement in basic movement skills achieved by students through physical fitness training is also in line with the formation of positive habits and a healthy lifestyle.

Table 4. Results of the great indonesian children Survey

Assessment Aspect	High Percentage	Medium Percentage	Low Percentage
Daily Physical Activity	70	25	5
Healthy Lifestyle	68	27	5
Positive Character Traits	75	22	3

The results of the questionnaire analysis showed that most students experienced an increase in positive habits aspects of 70% of students in the high category for daily physical activity, 68% of students in the high category for healthy lifestyles, 75% of students in the high category for positive characters. The following is the distribution of great indonesian children's aspects (Pie Diagram) in Figure 3.

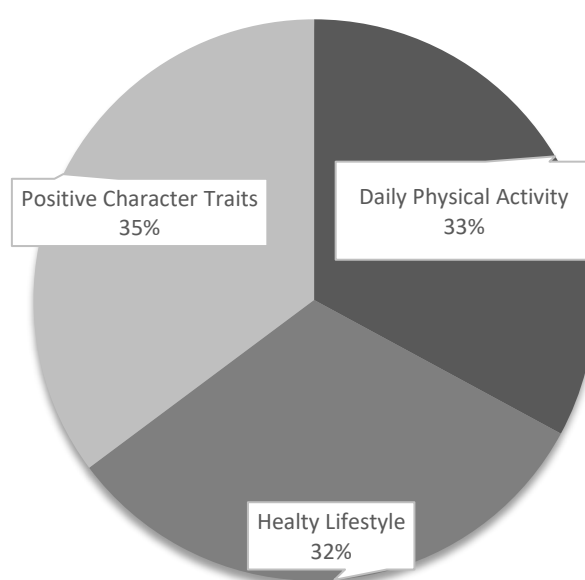


Figure 3. The results of comparision pretest dan posttest

The pie chart shows the distribution of contributions from each aspect of great indonesian children in the high category. Positive character aspects dominate with 37%, followed by daily physical activity (35%), and a healthy lifestyle (33%) of the total student responses. This illustrates that improving motor skills not only impacts physical abilities but also goes hand in hand with the formation of healthy habits and positive character in students.

The integration of the questionnaire data results with the results of the basic motor skills test shows that improving basic motor skills goes hand in hand with the formation of healthy habits and positive character values for elementary school students or in other words, physical fitness training can be seen as an

effective intervention in supporting the realization of the habits of great Indonesian children.

Discussion

The findings of this study reaffirm that structured, game-based physical fitness training significantly enhances elementary school students' Fundamental Movement Skills (FMS), particularly in agility, leg power, and coordination. These physical improvements not only indicate better neuromuscular efficiency and sensorimotor control but also contribute to shaping positive behavioral outcomes. Specifically, the development of FMS through structured activity fosters active participation, discipline, and teamwork three of the seven core habits promoted in the Great Indonesian Children (AIH) framework. This relationship emerges because physical exercise, when carried out systematically and collaboratively, instills consistency, accountability, and perseverance key behavioral attributes underpinning an active and healthy lifestyle. The social environment, and parental support are necessary for a collaborative effort between schools, parents, and the government (Norito et al., 2025).

Evidence indicates that perceived motor competence serves as a mediator between actual motor proficiency and physical activity levels, although this mediating effect is relatively modest in children and becomes more pronounced during adolescence (De Meester et al., 2016; den Uil et al., 2023; Menescardi et al., 2022). Improvements in motor performance are consistently linked to increased self-efficacy, intrinsic motivation, and perceived competence, which collectively function as psychological pathways connecting physical capability to habitual behavioral outcomes. As children experience mastery in skills such as running, jumping, and throwing, their confidence in their movement abilities strengthens, subsequently promoting greater engagement in physical activity. This reciprocal mechanism illustrates how enhanced fundamental movement skills contribute not only to physical development but also to behavioral self-regulation, emotional resilience, and positive social interaction (Dapp et al., 2021; Huang & Choosakul, 2025).

In the context of this study, the observed gains in FMS translated into tangible behavioral outcomes. Increased agility and speed reflected not only physical enhancement but also the internalization of an active lifestyle habit, where students exhibited greater enthusiasm for physical participation. The improvement in coordination and accuracy through Target Throwing promoted teamwork and communication, as many activities were completed in pairs or groups, requiring collaboration and shared responsibility. Similarly, the increase in lower-limb strength observed in the Standing Long Jump corresponded to the habit of discipline and persistence, as students learned to follow structured routines and complete progressive tasks over multiple sessions.

These findings align with motor development theory ([Barnett et al., 2016](#); [Gallahue, 2006, 2012](#)), which posits that fundamental motor proficiency serves as the foundation for lifelong participation in physical activity. Furthermore, the behavioral outcomes observed are consistent with habit formation theory ([Keller et al., 2021](#)), which suggests that repeated exposure to structured, rewarding activities over time can lead to automaticity of positive behaviors such as regular exercise, cooperation, and self-regulation. This is consistent with research by [Field and Temple \(2017\)](#) and [Barnett et al. \(2024\)](#), which found that strong motor competence fosters self-confidence and increased participation in physical activity. In other words, this study strengthens empirical evidence that mastery of motor skills not only impacts physical ability but also plays a role in developing an active and healthy lifestyle.

A novel aspect of this study lies in the integration of fundamental motor skills test results with the great Indonesian children questionnaire. This approach allows researchers to not only assess the physical effects of the exercise program but also examine how motor skills improvements impact healthy lifestyle habits and character building. Thus, this study offers a more holistic perspective than previous research, which tends to focus solely on physical aspects ([Neil-Sztramko et al., 2021](#)).

An important contribution of this study is its emphasis on the importance of a fun, systematic, and tailored physical fitness program for Indonesian children not only to improve motor skills but also as a physical activity-based character education strategy. The integrative framework of this study offers a novel contribution by linking motor competence development with behavioral formation in the context of the Great Indonesian Children initiative. Unlike previous research that focused solely on physical outcomes ([Dobbins et al., 2013](#)), this study demonstrates how physical fitness training can serve as both a motor learning mechanism and a behavioral education medium. By combining structured motor tasks with social interaction and feedback, students internalize both movement proficiency and pro-social behaviors such as cooperation, persistence, and responsibility traits essential for character development and holistic education.

Furthermore, the findings support the assertion by [Drenowatz et al. \(2021\)](#) that good motor competence underpins long-term health behavior by strengthening motivation and reducing barriers to participation. Thus, physical education should not be viewed merely as exercise but as a formative process where physical, cognitive, and affective domains converge.

Despite these promising outcomes, this study acknowledges several limitations. The quasi-experimental design without a control group restricts causal inference, and the relatively short ten-week duration may not capture long-term habit formation. Additionally, the reliance on parental questionnaires

introduces potential perception bias. Future studies should adopt randomized controlled or cluster-based designs, increase training frequency (≥ 2 sessions per week), and incorporate direct behavioral observations to validate the sustained behavioral impact of fitness-based interventions.

In conclusion, this research provides empirical evidence that game-based physical fitness training not only improves children's fundamental motor skills but also promotes positive behavioral habits aligned with national character education goals. The integration of physical competence, social collaboration, and self-discipline into structured activity design offers a holistic pedagogical model for fostering the Habits of Great Indonesian Children. These findings contribute significantly to theoretical discourse in physical education and present practical implications for curriculum reform, teacher training, and national health promotion initiatives.

CONCLUSION

This study shows that physical fitness training significantly improves elementary school students' basic motor skills, including speed, leg muscle strength, and motor coordination. These improvements are accompanied by positive changes in physical activity habits, healthy lifestyles, and character, as identified by the great Indonesian children instrument. The novelty of this study lies in the integration of basic motor skill measurements with assessments of healthy habits and character, providing a more holistic picture of the impact of physical fitness interventions. This approach not only strengthens motor development theory and previous research findings but also adds a new perspective that improving motor skills can directly contribute to the formation of healthy lifestyle habits and positive character values in children.

Practically, this study contributes to the development of physical education strategies in Indonesia by providing an empirical basis that enjoyable, systematic, and child-specific physical fitness training can support the great Indonesian children program. These results are relevant as references for teachers, curriculum developers, and education policymakers in designing more effective and long-term physical education programs. However, this study has limitations related to its quasi-experimental design without a control group, the relatively short intervention duration, and potential bias in the questionnaire data. Therefore, further research is recommended to use experimental designs with controls, extend the duration of the intervention, and combine qualitative and quantitative methods to obtain a more comprehensive understanding.

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