



## **Optimizing Physical Activity as a Preventive Effort to Stunting in Students**

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### **Abstract**

**Background:** Stunting remains a critical public health challenge among school-aged children in Indonesia, reflecting long-term nutritional deficiencies and broader socio-economic disparities. While nutritional interventions have been widely emphasized, preventive strategies that integrate physical activity remain underexplored in educational settings. Physical activity plays a vital role in supporting growth, musculoskeletal development, metabolic regulation, and overall child health, thereby offering complementary value in stunting prevention efforts.

**Aims:** This community service activity aimed to enhance teachers' understanding of physical activity as a preventive strategy against stunting among students through structured educational seminars.

**Methods:** The program was implemented through a one-day offline seminar conducted at the Hizbul Qur'an Elbanjary Foundation, involving sixteen participants consisting of teachers, school administrators, and community representatives. The seminar integrated expert presentations on nutrition and physical activity, interactive discussions, and reflective sessions. Program effectiveness was evaluated using a pretest–posttest design to measure changes in participants' understanding.

**Conclusion:** The findings demonstrated a substantial improvement in participants' understanding following the seminar. The mean pretest score of 56.1 increased to 84.1 in the posttest, indicating enhanced comprehension of the integrative role of physical activity in stunting prevention. Participants also showed increased engagement and awareness of holistic approaches combining nutrition and physical activity.

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### **INTRODUCTION**

In the era of advances in education and health sciences worldwide, stunting has become one of the most significant public health problems, particularly among students. The main cause of stunting is inadequate nutritional intake for the foetus during pregnancy (Mulyani et al., 2025; Saleh et al., 2021; Suyanto et al., 2024). Stunting refers to a condition of growth failure in children under five years of age, characterised by a height that is relatively lower than the standard established for children of the same age. Therefore, stunting is not only a health indicator, but also a reflection of social and economic inequality.

In Indonesia, nutritional problems have become a serious urgency, as indicated by the high number of malnutrition cases among children of school entry age (Al Khairiyah et al., 2025; Atamou et al., 2023). Malnutrition is defined as a deficiency, excess, or imbalance in nutritional intake. Based on data from the Ministry of Health, the stunting rate in Indonesia in 2024 was recorded at 19.8 per cent (Kemenkes RI, 2024). Various efforts have been undertaken to address stunting, and one potential strategy that is often overlooked in stunting prevention is the optimisation of physical activity among students.

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Children require sufficient physical activity for growth and development (Alves & Alves, 2019; Wang et al., 2023). Research shows that physical activity not only supports muscle and bone growth, but also improves metabolic health, cardiovascular health, and cognitive ability (Dimitriadis et al., 2025; Giolo-Melo & Pacheco, 2023). However, many children are insufficiently engaged in beneficial physical activities, often due to several factors, such as sedentary lifestyles, limited facilities, and a lack of knowledge regarding the benefits of physical activity.

As a preventive effort against stunting, the optimisation of physical activity focuses on the development of sports programmes and physical activities specifically designed for school-aged children (Au et al., 2025; Nugroho et al., 2023). These programmes are systematically and structurally designed to enable children to engage in regular physical activity, which in turn reduces the risk of stunting and supports healthy growth (Devi Artanti et al., 2022). These programmes not only include regular exercise, but also involve education on healthy lifestyles and balanced dietary patterns, which complement stunting prevention efforts.

Students are a highly important group within education that requires special attention in stunting prevention. Schools can serve as effective settings to support stunting prevention, as they play a strategic role in optimising students' physical activity through various organised programmes and activities (Hariawan et al., 2024). Fundamentally, students affected by stunting have a higher risk of delayed motor and cognitive development. This condition may lead to wider educational disparities, as children with stunting often face difficulties in achieving optimal academic outcomes. Some possible impacts experienced by children with stunting include increased vulnerability to illness, below-average intelligence levels, and eventual effects on daily productivity (Lameky, 2024).

Based on these conditions, the Community Service Team of Universitas Ma'arif Nahdlatul Ulama Kebumen carried out efforts to address stunting by implementing educational seminars for teachers at the Hizbul Qur'an Elbanjary Foundation, an educational institution that oversees three levels of education, namely kindergarten, madrasah ibtidaiyah, and an Islamic boarding school. This seminar activity aimed to improve knowledge regarding the prevention of stunting among students.

## METHOD

The implementation method section is an important space to describe the concrete steps that are designed with empathy and care in responding to the issues faced by the community as activity partners. The number of participants in this seminar activity was 16 people, consisting of three invited guests, one foundation chairperson, and 12 teachers. The demographic data of the seminar participants can be seen in Table 1 below.

**Table 1.** Demographic Data of Participants

No	Initials	Gender	Occupation
1.	S.	Lk	Village Head
2.	H.	Lk	Foundation Chairperson
3.	K.	Lk	Teacher
4.	I.	Pp	Teacher
5.	L.M.	Pp	Teacher
6.	L.	Pp	Teacher
7.	N.H.	Pp	Teacher
8.	R.K.J.	Pp	Teacher
9.	S.M.	Pp	Teacher
10.	S.C.K.	Pp	Teacher
11.	T.	Pp	Teacher
12.	U.K.	Pp	Teacher
13.	V.M.	Pp	Teacher
14.	V.A.	Pp	Teacher
15.	R.	Lk	School Committee
16.	U.	Lk	School Committee

Notes: Lk= male; Pp= female

The seminar was conducted offline at the Hall of MI Ma'arif Hizbul Qur'an Parakan for one day on 22 August 2024. The activity took place from 09.30 to 12.30 WIB with a total duration of four hours. The seminar activities were divided into several stages. The first stage (Session 1) consisted of the presentation of material and stunting counselling delivered by the speaker Mekarningrum, A.Md.Gz., from UPT Puskesmas Purwanegara 1. The second stage (Session 2) involved the presentation of material by the speaker Erick Burhaein, M.Pd., AIFO. The seminar concluded with a third session in the form of a question and answer session (discussion session).

The selection of the seminar activity entitled "Optimisation of Physical Activity as a Preventive Effort against Stunting in Students" was considered a very important forum, given the urgency of the stunting problem, which is quite concerning. Therefore, it is expected that educational institutions will be able to contribute more effectively to stunting prevention efforts through the optimisation of physical activity.

## RESULTS AND DISCUSSION

### Results

The seminar activity began with an opening and welcoming remarks at 09.30–10.00 WIB, followed by the presentation of the first session by the speaker from UPT Puskesmas Purwanegara 1, namely Mekarningrum, A.Md.Gz., with the topic "Stunting and Nutrition in School-Age Children", as shown in [Figure 1](#). The first material presentation took place from 10.00 to 11.00 WIB.



**Figure 1.** Seminar Presentation Session 1

At this stage, participants were provided with an understanding of the definition of stunting, its characteristics, the causes of stunting, and the optimisation of nutrition for school-age children. The material was delivered through a PowerPoint presentation by the speaker to enable participants to better comprehend and understand the content. The response from the participants was very positive, and they were able to receive the material well as additional knowledge related to stunting and nutrition in school-age children. After the presentation, a discussion and question-and-answer session was conducted as the closing of the first session to assess the extent to which participants had understood the material presented.

During the discussion session, one participant raised a question related to the appropriateness of stunting intervention programmes. The speaker then provided a practical and easily understood explanation to address the participant's uncertainty. The condition of the seminar forum during the discussion session can be seen in [Figure 2](#).



**Figure 2.** Seminar Implementation Condition

The presentation entitled “Optimisation of Physical Activity as a Preventive Effort against Stunting in Students” was delivered by the speaker Dr Erick Burhaein, M.Pd., AIFO, and formed part of the second session. The presentation of the second session commenced at 11.00 and concluded at 12.30 WIB. The appearance of the presentation for Session 2 can be seen in [Figure 3](#).



**Figure 3.** Seminar Presentation Session (Powerpoint)

The second stage of the seminar consisted of an explanation regarding the optimisation of physical activity as a preventive effort against stunting among students. In this session, participants were also provided with presentation materials delivered via PowerPoint by the speaker. The participants’ responses indicated a high level of enthusiasm in following and understanding the material, as reflected in the questions raised by several participants. The first question concerned the effectiveness of exercise in preventing stunting, while the second related to the optimisation of physical activity for students with a history of congenital diseases. The speaker provided detailed and easily understandable explanations to address the participants’ questions. The condition of the seminar forum during the discussion session can be seen in [Figure 4](#).



**Figure 4.** Seminar Implementation Condition Session 2

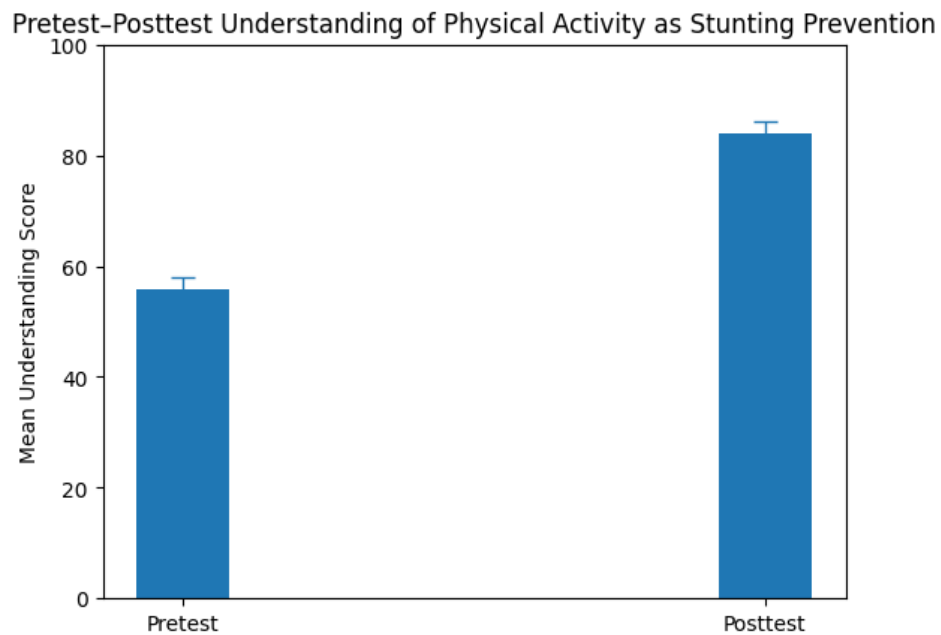
To evaluate the effectiveness of the seminar on optimizing physical activity as a preventive strategy against stunting, participants' understanding was assessed using a pretest-posttest design. The assessment measured participants' comprehension of the role of physical activity in supporting growth, preventing malnutrition-related growth failure, and complementing nutritional interventions in school-aged children (Table 2).

**Table 2.** Individual Pretest-Posttest Scores of Parental Understanding

Participant	Pre-test Score	Post-test Score
Parent 1	54	82
Parent 2	56	84
Parent 3	52	80
Parent 4	58	86
Parent 5	60	88
Parent 6	55	83
Parent 7	57	85
Parent 8	53	81
Parent 9	59	87
Parent 10	56	84
Parent 11	54	82
Parent 12	55	83
Parent 13	57	85
Parent 14	58	86
Parent 15	56	84
Parent 16	54	82

Source: Primary Data

The figure illustrates a clear increase in the mean pretest score (56.1) to the mean posttest score (84.1), with error bars representing score variability among participants (Figure 5).



**Figure 5.** Mean Pretest-Posttest Understanding of Physical Activity as Stunting Prevention

The results demonstrate a substantial improvement in participants' understanding following the seminar intervention. Prior to the activity, participants showed limited awareness of the integrative role of physical activity in stunting prevention, often perceiving nutrition as the sole determinant of growth. After the seminar, participants exhibited a more comprehensive understanding that physical activity supports bone development, muscle strength, metabolic regulation, and overall growth when combined with adequate nutritional intake. The relatively narrow variability in posttest scores indicates that the seminar was effective across participants with diverse professional roles and prior knowledge levels. The use of contextual examples, evidence-based explanations, and interactive discussion facilitated meaningful learning and encouraged participants to reconsider existing assumptions regarding stunting prevention strategies.

Synthesizing the individual and aggregate results, the findings confirm that educational seminars focusing on physical activity can significantly enhance stakeholder understanding of stunting prevention. The pretest-posttest improvement demonstrates that physical activity education serves as a critical complement to nutritional interventions, reinforcing a holistic approach to child growth and development. These outcomes highlight the value of community service programs in empowering educators and stakeholders with actionable knowledge, ultimately supporting healthier, more resilient student populations through integrated physical activity and nutrition strategies.

## Discussion

Stunting is a condition in which an individual experiences chronic malnutrition over a long period, particularly during the first 1,000 days of life (the first 1,000 HPK), resulting in a height that is shorter than that of peers of the same age. The first 1,000 days of life represent a critical period for a child's growth and development, calculated from conception until the age of two years. Several factors contribute to stunting, including inadequate nutritional intake during pregnancy and suboptimal parenting practices related to feeding behaviour.

In efforts to fulfil children's nutritional needs, several micronutrients play an important role in preventing stunting, including four key nutrients: zinc, calcium, iron, and iodine. Zinc functions in bone metabolism, wound healing, immune function, and the development of male reproductive function (Harwijayanti et al., 2022; Priyantini et al., 2023). Food sources of zinc include liver, shellfish, eggs, and legumes. Calcium functions in the formation of bones and teeth, blood clotting, and muscle contraction (TW et al., 2024; Wiyono et al., 2023). Food sources of calcium include dried anchovies, eel, milk, cheese, and legumes. Iron functions in the immune system, brain growth, and energy

metabolism (Dermawan et al., 2025; Utami et al., 2023). Sources of iron include liver, eggs, fish, legumes, green vegetables, and fruits. Iodine is essential for thyroid hormone production, which regulates metabolism, growth, and bodily development (Abri et al., 2022; Sulistyani & Setyaji, 2024). Iodine is also important in preventing goitre and growth retardation. Food sources of iodine include marine fish, shrimp, and shellfish.

Another effort to prevent stunting is through the optimisation of physical activity among students. Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (WHO, 2023). Physical activity is an important indicator in maintaining overall health, including in the prevention of stunting. Although physical activity alone cannot fully prevent stunting, it forms part of a healthy lifestyle that supports optimal growth. A combination of adequate nutrition and appropriate physical activity constitutes a strong foundation for preventing stunting and supporting holistic development.

Forms of physical activity used as preventive efforts against stunting among students include aerobic exercise and walking. Aerobic exercise involves whole-body movements that can improve blood circulation and support bone and muscle growth in children. Walking helps regulate body weight, reduce the risk of chronic diseases, and improve mental health, all of which contribute to the prevention of stunting (An & Chuo, 2022).

Thus, preventive efforts for students can be undertaken through the optimisation of physical activity. The combination of appropriate nutritional intake and regular physical activity represents a crucial foundation for preventing stunting and supporting comprehensive child development. This seminar successfully conveyed relevant and beneficial information and provided practical guidance that can be implemented in real-world settings.

### *Implications*

The findings of this community service activity imply that optimizing physical activity constitutes a strategic and practical component of stunting prevention efforts in school settings. The significant improvement in participants' understanding demonstrates that educators and stakeholders can meaningfully broaden their perspective beyond nutrition alone by recognizing physical activity as an essential contributor to growth, musculoskeletal development, and metabolic regulation. These implications highlight the importance of integrating structured physical activity education into school health programs, thereby promoting a holistic approach to child development that addresses both nutritional and physical determinants of stunting.

### *Contribution of Community Service*

This community service initiative contributes substantially to stunting prevention by strengthening the capacity of teachers and school stakeholders to implement health-oriented educational practices. Through the seminar, participants gained evidence-based knowledge regarding the role of physical activity in supporting optimal growth and preventing growth failure among students. The activity also fostered collaboration between higher education institutions, schools, and health practitioners, reinforcing the role of community service as a bridge between scientific knowledge and practical application. As such, the program supports the empowerment of educational institutions as active agents in promoting student health and well-being.

### *Limitations*

Despite its positive outcomes, this activity has several limitations that should be acknowledged. The number of participants was relatively small and limited to a single educational foundation, which may restrict the generalizability of the findings. In addition, the evaluation relied primarily on short-term pretest–posttest measurements, providing limited insight into long-term knowledge retention and behavioral change in school practices. The activity also focused on cognitive understanding rather than direct observation of changes in students' physical activity patterns, which could have strengthened the overall evaluation.

### *Suggestions*

Based on these limitations, future community service and research activities are recommended to involve a broader range of schools and educational stakeholders across different regions.

Longitudinal follow-up programs should be implemented to assess the sustainability of knowledge transfer and its impact on daily physical activity practices among students. It is also suggested that future initiatives integrate practical demonstrations, school-based physical activity programs, and collaboration with nutrition and public health sectors. By expanding scope, duration, and interdisciplinary cooperation, community service programs can further enhance their contribution to comprehensive and sustainable stunting prevention strategies.

### CONCLUSION

This community service program was initiated in response to the urgent need identified in the Introduction to strengthen stunting prevention efforts through approaches that extend beyond nutritional interventions alone. As expected, the results and discussion demonstrate that optimizing physical activity represents a meaningful and complementary strategy in addressing stunting among students. The seminar successfully enhanced participants' understanding of the integrative role of physical activity in supporting growth, musculoskeletal development, and metabolic health, thereby aligning educational objectives with the actual needs encountered in school settings.

The significant improvement in pretest–posttest scores confirms that structured, evidence-based educational interventions can effectively transform limited initial awareness into comprehensive and applicable knowledge. These outcomes validate the premise that schools and educators hold a strategic position in promoting holistic child development, particularly when physical activity is systematically integrated with nutritional awareness. Moreover, the positive engagement and reflective responses observed among participants indicate that the program not only conveyed information but also fostered confidence and readiness to implement healthier practices within educational environments.

Looking forward, the findings of this program offer promising prospects for the development of more sustainable and scalable community service initiatives. Future efforts should incorporate longitudinal monitoring, practical school-based physical activity programs, and interdisciplinary collaboration involving health, nutrition, and education sectors. By strengthening continuity and application, similar programs can contribute more broadly to reducing stunting prevalence while supporting students' long-term physical, cognitive, and social development in a comprehensive and sustainable manner.

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### AUTHOR CONTRIBUTION STATEMENT

EB conceptualized and designed the community service program, served as the main speaker, coordinated the seminar implementation, analyzed the data, and drafted the original manuscript. DA contributed to the preparation of educational materials, facilitated seminar activities, supported data collection, and critically reviewed the manuscript to strengthen academic rigor and coherence. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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