



EMPOWERING CHILDREN TO ASSESS THEIR NUTRITIONAL STATUS: THE EFFECTIVENESS OF A NUTRITION EDUCATION MODULE

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ABSTRACT

Various forms of malnutrition occur among school-aged children, including undernutrition, overnutrition, and micronutrient deficiencies. Assessing nutritional status is essential to identify appropriate strategies for preventing more severe nutritional problems. However, many children do not know how to detect their nutritional status early, one of which can be done through anthropometric measurements. This study aimed to determine the effect of the Nergizi Module on improving students' skills in measuring nutritional status. Method: This study employed a pre-experimental design using a one-group pretest–posttest approach. Respondents were selected through purposive sampling, involving 60 elementary school students in Palembang City, South Sumatra. The intervention was conducted three times through educational sessions using the Nergizi Module developed by the research team. Data were collected by assessing students' skills in determining nutritional status before and after the intervention using an observation checklist. Univariate analysis was used to describe respondent characteristics, and bivariate analysis was performed using McNemar test. The results showed an improvement in students' skills after the intervention, where initially only 12 students were categorized as having good skills, increasing to 46 students after the intervention, with a p-value of 0.001 using McNemar test. Health education using educational modules can improve students' skills in assessing nutritional status through anthropometric measurements. The findings of this study are expected to enhance students' ability to identify their nutritional status, thereby helping to prevent nutritional problems.

Keywords: anthropometric measurement; health education; module; nutritional status; school children

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INTRODUCTION

One of the health problems in children, especially school-age children, is nutritional problems. Currently, nutritional problems in school-age children include various conditions such as malnutrition, overnutrition and micronutrient deficiency. Data from the results of the Indonesian Health Survey shows that the picture is concerning for school-age children nationally, 11.4% of children belong to the thin category consisting of 3.8% very thin and 7.6% thin, while on the other hand the obesity rate reaches 19.7% consisting of 10.5% obese and 9.2% obese (Kemenkes, 2023).

The risk factors for nutritional problems in school-age children are multi-factorial. Behaviors that exist in school-age children along with their development contribute to the occurrence of nutritional problems. The behavior of school-age children is one of the important determinants that contribute to the occurrence of various forms of malnutrition, both undernutrition and overnutrition. At this age, children begin to have independence in choosing foods so that their consumption patterns are often influenced by taste preferences, school environment, and exposure to unhealthy foods such as foods high in sugar, salt, and fat. In addition, unhealthy habits such as skipping breakfast, low consumption of fruits and vegetables, and high consumption of processed foods can also increase the risk of nutritional status imbalances. Research shows that unhealthy eating behaviors and low physical activity are associated with an increased risk of overweight and obesity in schoolchildren (Nurwanti et al., 2019). In addition, high exposure to innutritious foods and low physical activity in school-age children in Indonesia also increase the likelihood of overweight and obesity (De Vries

Mecheva et al., 2023). The habit of skipping breakfast is also known to be associated with various metabolic disorders as well as an increased risk of obesity in children and adolescents (Guo et al., 2024).

The impact of nutritional problems on children cannot be underestimated. Malnutrition in elementary school-age children, both in the form of undernutrition, overnutrition, and micronutrient deficiencies, can have various negative impacts on children's health and development, both in the short and long term. In the short term, malnutrition and a lack of micronutrients such as iron, vitamin A, and iodine can lead to impaired physical growth, decreased immunity, and decreased cognitive ability and concentration in school. In contrast, overnutrition characterized by overweight and obesity can increase the risk of metabolic disorders from an early age, including insulin resistance and hypertension. In the long term, children who are malnourished have a higher risk of impaired cognitive development, decreased academic achievement, and an increased risk of non-communicable diseases such as type 2 diabetes mellitus, cardiovascular disease, and metabolic syndrome in adulthood (Black et al., 2013; Rachmi et al., 2021). In addition, micronutrient deficiencies are also known to affect brain development and children's learning abilities, thus having an impact on the quality of human resources in the future (Keats et al., 2021).

Although the impact of malnutrition has a great effect on the quality of life of children in the future. However, the fact is that children are still not able to carry out early detection of their nutritional status independently as an initial effort in preventing nutritional problems. Various nutrition education programs have been developed in the school environment, but children's ability to understand and monitor their own nutritional status is still relatively limited. Nutritional literacy in children not only includes knowledge about healthy food, but also includes the ability to obtain, understand, and use nutritional information in assessing the health condition of their body, including through objective indicators such as body mass index and anthropometric measurements. Low nutritional literacy can cause children to be less able to recognize their own health conditions and less aware of the risks related to nutritional problems such as malnutrition and obesity. Research shows that nutritional literacy in school children is closely related to health behaviors and food consumption patterns that affect their nutritional status (Liu et al., 2025). In addition, low levels of health and nutrition literacy can also affect a child's ability to make decisions related to healthy eating and health management independently (Kasimoğlu & Gürarslan Baş, 2024). Therefore, improving nutritional literacy that not only focuses on knowledge but also on practical skills to understand and monitor nutritional status is very important in efforts to prevent various malnutrition problems in school-age children.

In addition to knowledge, skills in accurately measuring nutritional status also play an important role in the early detection of growth problems. Inaccuracies in anthropometric measurements can lead to misinterpretations of nutritional status, potentially hindering efforts to identify early nutritional problems in children. Research shows that training on anthropometric measurement techniques can improve the ability of health workers and cadres to determine nutritional status more accurately (Perumal et al., 2020). Another study also reported that improving competency through structured training was able to improve the quality of anthropometric measurements and increase the reliability of child growth data (Fithri et al., 2025).

Various educational media have been developed to improve knowledge and skills related to nutrition, ranging from conventional counseling, audiovisual media, to the use of digital technology. However, the effectiveness of learning media is greatly influenced by the structure of the material, ease of use, and the sustainability of the learning process. Structured and community-based educational interventions have been shown to be more effective in improving nutrition literacy and health skills than one-way education methods without systematic guidance (Sari et al., 2025).

One of the educational media that is considered effective in improving understanding and skills is the learning module. The module has the advantage of presenting material that is systematic, can be learned independently or with assistance, and allows the evaluation of learning outcomes gradually. Research shows that the use of structured modules or teaching materials in health education is able to significantly improve participants' knowledge, skills, and changes in health behavior after intervention (Chatterjee & Nirgude, 2024a). The module-based learning approach also allows for integration between theoretical and practical concepts, making it very relevant to improve skills in independently measuring nutritional status.

In the context of school-age children as learning subjects, a module-based approach can be an innovative strategy to improve nutritional literacy as well as basic skills in understanding their own nutritional status. Education that actively involves children can form awareness from an early age on the importance of growth monitoring. This approach is in line with promotive and preventive principles in child nursing that emphasize individual and family empowerment.

Based on this description, the development and implementation of the Nergizi module (Ners Cilik Peduli Gizi) as an educational medium to improve skills in measuring nutritional status is relevant for research. This research is expected to contribute to strengthening evidence-based education strategies in efforts to prevent nutritional problems in children, as well as become a reference for community nursing practices and child health policies in Indonesia.

METHOD

This study is a quantitative research with a pre-experimental design and a one group pre and post-test design approach. The design of this study was chosen to see the influence of the Nergizi learning module on improving students' skills on how to assess nutritional status by means of anthropometric measurement. This research was carried out in September 2026 at one of the elementary schools in Ilir Barat 1 District, Palembang City, South Sumatra, Indonesia. The population in this study is 62 students from high grade elementary school students, namely fourth grade and fifth grade. Sampling using total sampling. The inclusion criteria in this study are students who attend school and are willing to participate in research activities known by parents/guardians of students, students who have never received health education about nutrition problems from health workers, and students who can read and write fluently. In this study, the sample used was 60 students, 2 other students did not meet the inclusion criteria because they were not present at the time of the activity.

The intervention was carried out by conducting health education using the Nergizi (Ners Cilik Peduli Gizi) module that had been developed by the research team. Before intervening, the research team gave a pre-test to the respondents and a post test after the implementation of the intervention. The intervention using the Nergizi module was carried out for 3 consecutive days, namely all respondents read the Nergizi module 1 time for 1 intervention and was facilitated by the research team, especially when the material calculated the nutritional status of students with BMI calculations at the first meeting. One intervention of the respondents took 35 minutes per a meet.

Data collection on students' nutritional status assessment skills was carried out before and after the intervention. The measuring tool to assess students' skills is to use observation sheets made by the research team based on nutritional status assessment sources using anthropometric assessments which include aspects of body size assessment, namely height and weight, calculation of appropriate BMI values, and interpretation of nutritional status based on BMI values that have been obtained. The total aspects assessed by the research team through observation sheets were 10 correctness of actions that were assessed by being done correctly and done inappropriately. Using the Gutmann scale. The skill variables for assessing early nutritional status are divided into 2 measurement results, namely good skills and bad skills. The research team that has the task of

assessing skills before and after the intervention has equalized perceptions in assessing variable skills so that there is a risk of differences in assessment when determining the value of students' skills.

The univariate analysis used was to assess the characteristics of the respondents, namely gender and age as well as the variables of nutritional status assessment skills before and after the intervention. The test used for bivariate analysis is the McNemar test. The observation sheet used in this study to assess students' skills in assessing nutritional status before and after the intervention has been tested for validity and reliability in one of the schools in Gandus District, Palembang to as many as 30 elementary school students. The results of the validity test showed that all items of the skill action statement had a calculated r value greater than the r table (r table 0.361) and a reliability value using Cronbach's alpha coefficient which had a value of $\alpha = 0.805$ (> 0.70) which had a reliable meaning. This Study received ethical approval from Medical and Health Research Ethics Committee of Faculty of Medicine, Sriwijaya University, with protocol number 393-2025. In this study, there was no invasive action or biological sampling so it is expected that the risk to the respondents is minimal. Each respondent gave their willingness through their parents who had explained the procedure for this research activity through an informed consent sheet.

RESULT

Tabel 1.
Frequency distribution of respondent characteristics

Characteristics	Category	f	%
Gender	Boys	32	53.33
	Girls	28	46.67
Age	9 years	2	3.33
	10 years	46	76.67
	11 years	12	20
Nutritional status assessment skills before intervention (Pre-test)	Good	12	20
	Poor	48	80
Nutritional status assessment skills after intervention (Post test)	Good	46	77
	Poor	14	23

Table 1 shows that the majority of students are male with a percentage of 53.33%. Most of the respondents were at the age of 10 years (76.67%). Students' skills in assessing nutritional status before the majority intervention was carried out in the poor category (80%) and after the majority intervention was carried out became skills in the good category with a percentage of 77%.

Tabel 2.

The effect of the Nergizi module on nutritional status assessment skills before and after the intervention

		Intervention						p-value	χ^2 McNemar
		Skills after intervention (post-test)							
		Good		Poor		Total			
		f	%	f	%	f	%		
Skills before intervention (pre- test)	Good	10	16.7	2	3.3	12	20	0.001	28.66
	Poor	36	60	12	20	48	80		
	Total	46	76.7	14	23.3	60	100		

Table 2 shows that the number of students who had good skills in assessing nutritional status increased from 12 respondents (20.0%) before the intervention to 46 respondents (76.7%) after the intervention. A total of 36 respondents (60.0%) experienced an improvement in skills from the poor category to good after education using the Nergizi module. On the other hand, there were 2 students who experienced a decrease in skills. The results of the McNemar test showed that there was a significant difference between students' skills before and after the intervention (p value 0.001)

DISCUSSION

The results showed that most of the respondents were male (53.33%) and the majority were at the age of 10 years (76.67%). This characteristic shows that respondents are in the middle childhood

stage, which is a developmental period in which children begin to have better cognitive abilities to understand health concepts and are able to follow practical instructions in the learning process. At elementary school age, children's cognitive development allows them to understand simple health-related concepts, including how to monitor body condition through nutritional status measurements. Therefore, educational interventions in this age group are considered very effective because children are beginning to be able to internalize health knowledge and skills independently. Previous research has shown that nutrition education programs provided to school-age children can significantly improve health understanding and nutrition-related behaviors because in this phase children begin to develop logical thinking skills and problem-solving skills (Selamat et al., 2025).

The results of this study also showed that before the intervention, most students had poor skills in conducting nutritional status assessments (80%). This condition shows that even though children are old enough to understand the concept of health, knowledge and practical skills related to monitoring nutritional status are still very limited. These skills include the ability to make anthropometric measurements, calculate Body Mass Index (BMI), and interpret measurement results into appropriate nutritional status categories. This lack of skills can be caused by limited practical education regarding nutritional status measurement in the school environment. In fact, anthropometric measurements such as weight and height are simple, cheap, and effective methods to detect nutritional problems in school-age children, so it is very important to be introduced early (Novita et al., 2025).

After the intervention using the Nutrition module, there was a significant improvement in students' skills in assessing nutritional status, where most of the respondents were in the good skills category (77%). The results of the McNemar test showed a significant difference between students' skills before and after the intervention ($p < 0.001$). These findings suggest that the use of structured learning media such as modules can improve students' practical skills in measuring nutritional status. The module provides students with the opportunity to study the material systematically and repeatedly so that the learning process becomes more effective. Previous research has shown that structured nutrition education interventions can significantly improve school children's health knowledge and attitudes, ultimately impacting their ability to understand nutrition status indicators (Selamat et al., 2025).

The improvement of students' skills in this study can also be seen from their ability to make precise anthropometric measurements, especially in the aspects of weight and height measurement. Anthropometric measurements are a standard method in assessing nutritional status because they can provide an objective picture of child growth. However, errors in measurement techniques such as improper body position, misaligned measuring instruments, or misreadings of scales can lead to misinterpretation of nutritional status. Research on anthropometric training shows that the provision of structured training is able to improve the accuracy of height and weight measurements and significantly improve the quality of child growth data (Shukla et al., 2025). This suggests that the improvement of students' skills in this study is most likely influenced by the practical learning process provided through the modules.

In addition to skills in conducting anthropometric measurements, improvements are also seen in students' ability to calculate Body Mass Index (BMI). BMI is an indicator that is commonly used to assess the nutritional status of school-age children because it can describe the balance between weight and height. Understanding how to calculate BMI is very important so that students can monitor their nutritional status independently. Previous research has shown that education about the relationship between BMI and balanced nutrition can improve students' understanding of their body condition and encourage healthy living behaviors (Hanifah et al., 2022). Thus, learning about BMI calculation in the Nutrition module is likely to be one of the factors that contribute to improving students' skills in this study. In addition, students' ability to interpret BMI measurement results into

nutritional status categories also improved after the intervention. The interpretation of nutritional status is an important stage in the assessment process because the results of anthropometric measurements have no clinical significance without proper interpretation. Through the learning module, students are not only taught how to take measurements, but also how to relate measurement results to nutritional status categories such as thin, normal, or obese. Learning approaches that integrate theory and practice have been proven to improve students' understanding of complex health concepts. Other research suggests that structured health education programs in schools can improve students' ability to understand the relationship between health behaviors, nutritional status, and future disease risk (Pritasari et al., 2024).

In addition to improving technical skills in measuring nutritional status, the use of educational modules also plays an important role in improving health literacy in school-age children. Health literacy in children includes not only the ability to understand health information, but also the ability to apply this knowledge in daily practice, including monitoring their own body condition. Through module-based learning, students get the opportunity to learn nutrition concepts systematically while practicing the skills they have learned. This approach has proven to be effective because the combination of knowledge and hands-on practice can strengthen students' understanding of health concepts. Research shows that increased nutritional literacy in school children is related to better ability to understand health-related information and make more informed decisions regarding diet and nutritional status (Vaitkeviciute et al., 2020). In addition, school-based nutrition education programs are also reported to be able to increase children's awareness of the importance of independent health monitoring (Verdonschot et al., 2023). In addition to the aspect of health literacy, the success of the intervention in this study can also be explained through the experiential learning approach, which is a learning process that emphasizes direct experience in acquiring knowledge and skills. In this study, students not only received information about nutritional status but were also actively involved in the process of measuring height, weight, BMI calculations, and interpretation of measurement results. The active involvement of students in the learning process has been proven to be able to improve conceptual understanding as well as practical skills needed in assessing nutritional status. Other research shows that health education interventions that integrate hands-on practice in the learning process provide more effective results than conventional lecture methods in improving health skills in school children (Dudley et al., 2021). In addition, the school-based health education approach also has great potential in shaping long-term health behaviors because school is a strategic environment to build healthy living habits from an early age (Chatterjee & Nirgude, 2024b).

The results of this study show that the Nergizi module is an effective educational medium in improving students' skills in assessing nutritional status. The module provides a systematic, interactive, and easy-to-understand learning approach for students, enabling them to improve practical skills in conducting anthropometric measurements, calculating BMI, and interpreting nutritional status. The results of this study are in line with various previous studies that show that nutrition education programs in schools have an important role in improving children's health literacy and encouraging students' active involvement in monitoring their own health conditions. With the increase in students' skills in assessing nutritional status, it is hoped that children will be more aware of their health conditions and be able to take preventive measures against various nutritional problems from an early age

CONCLUSION

This study demonstrates that the use of the Nergizi module is effective in improving the skills of elementary school students in conducting nutritional status assessments. Prior to the intervention, most students had poor skills in conducting anthropometric measurements, calculating Body Mass Index (BMI), and interpreting nutritional status appropriately. Following education using the Nutrition module, there was a significant increase in students' skills, where the majority of

respondents were in the good skills category. The results of the McNemar test indicated that there was a significant difference between students' skills before and after the intervention with a p value of 0.001, so it can be concluded that the Nutrition module is able to improve students' ability to measure weight and height correctly, calculate BMI values accurately, and interpret nutritional status accurately. The utilization of structured learning media such as modules can be an effective strategy in improving students' health literacy and practical skills related to monitoring nutritional status. The implementation of the Nergizi module in health education activities in schools is expected to assist students to better understand their nutritional conditions and encourage active involvement in efforts to prevent nutritional problems from an early age.

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