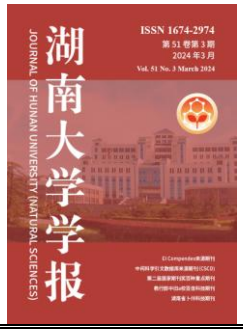

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Anthropometric Training Impact on CHWs' Skills in Child Height Measurement in Indonesia

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Abstract: This study evaluates the effectiveness of body measurement training for community health workers (CHWs) using a modified length board. The research is quasi-experimental, with a pretest and posttest non-equivalent group design. A total of 60 CHWs measured the length of 80 children in the intervention and control groups. The effect of the intervention was determined using the chi-square test. After the intervention, there was a significant change in CHWs' skills in positioning children, reading measurement results, and determining nutritional status. There were few differences in measurement results between the length board and the distance measuring tool. Overall, body measurement training with the modified length board as the main medium effectively improves CHWs' skills in measuring height and determining nutritional status.

Keywords: community health worker, nutrition status, anthropometric training, children.

人体测量培训对印度尼西亚社区卫生工作者儿童身高测量技能的影响

摘要：本研究使用改良的长度板评估社区卫生工作者(CHW)身体测量培训的有效性。该研究是准实验性的，采用前测和后测非等效小组设计。共有 60 名社区卫生工作者测量了干预组和对照组 80 名儿童的身长。使用卡方检验确定干预的效果。干预后，社区卫生工作者在定位儿童、阅读测量结果和确定营养状况方面的技能发生了显着变化。长度板和距离测量工具的测量结果差异不大。总体而言，以改良长度板为主要媒介的身体测量训练有效提高了社区卫生工作者测量身高和判断营养状况的技能。

关键词：社区卫生工作者、营养状况、人体测量培训、儿童。

1. Introduction

Child growth promotion initiatives at the community level facilitate timely nutritional interventions. Several anthropometric measurement techniques assess children's nutritional status, including height/length, weight, head circumference, and arm circumference [1], [2]. However, height/length and weight are most commonly used in community-level epidemiological studies because of their noninvasive, low-cost nature and the use of portable equipment [3], [4]. Community health workers (CHWs) currently conduct these anthropometric

activities, especially measuring children's heights at community health posts known as Posyandus. Posyandus serves as a strategic platform for education, particularly in enhancing the knowledge and skills of CHWs [4]. Effective growth monitoring at Posyandus requires skilled cadre members proficient in measuring toddlers' height [5], [6], with height-for-age being the most frequently measured trait to determine a child's nutritional status [7], [8].

CHWs play a crucial role in community-based health efforts [9], yet the focus on improving their anthropometric measurement skills remains insufficient. This is evident from various studies highlighting CHWs' lack of skills in conducting Posyandu activities [10-13]. CHWs are individuals selected and trained to address community health problems and collaborate with public health centers [13], [14]. For height measurement screening, CHWs typically use various tools such as an infantometer, microtoise, wooden rulers, measuring mats, and tapes [15], [16]. The diversity in these tools often leads to inaccurate length and height measurements, resulting in low precision, which is a significant concern in Posyandu activities [17]. Consequently, children's heights may vary significantly because of inaccurate tools and inconsistent skills of the measurers.

Skill development in individuals is a complex process involving the interplay of knowledge, attitude, and action across three domains: knowledge, skill, and attitude [18]. This research focuses on improving CHWs' skills in conducting anthropometric measurements, recognizing that becoming a skilled measurer requires training to enhance performance. Several studies have suggested methods to minimize measurement errors [19], [20], which significantly impact the determination of children's nutritional status.

This study proposes a new approach for conducting children's nutritional assessments using a simple measuring tool called a modified length board. A previous study reported high accuracy with it [21]. This study builds upon the existing literature on training programs and modified measurement tools by proposing a comprehensive approach that integrates both elements to enhance CHWs' skills in anthropometric measurements. This research identifies a gap in the literature regarding the development and evaluation of tailored measurement tools for CHW training, thus setting the stage for the current investigation.

The objective of this study was to assess the effectiveness of anthropometric training using a modified height measurement tool as the main media in improving CHWs' skills in determining children's height and detecting stunting.

The scope of this study encompasses the development, implementation, and evaluation of the modified measurement tool within the context of anthropometric training for CHWs, with the goal of improving nutritional outcomes among children in community settings.

The results of this study can be applied in practical ways, such as enhancing training programs using a modified height measurement tool. The insights gained from the research can be used to refine existing training programs for CHWs, focusing on improving their skills in measuring children's height and determining nutritional status. By equipping CHWs with enhanced anthropometric measurement skills, the quality and accuracy of child health services, particularly in growth monitoring and nutritional assessment, can be significantly improved. This, in turn, can lead to timely identification and intervention for malnutrition and stunting among children. The findings of this study can inform policy decisions aimed at strengthening community-based health systems, emphasizing the importance of investing in training and resources to support CHWs in their roles.

1.2. Objectives

The purpose of this study was to evaluate the efficacy of utilizing the modified measurement tool to enhance CHWs' skills in measuring and determining nutritional status.

2. Methods

This quasi-experimental study with a pre-test and post-test nonequivalent group design evaluated the impact of anthropometric training using the modified length board on CHWs, contrasting it with a control group trained using a stadiometer.

2.1. Population and Sample

The study population included all CHWs in three sub-districts, and the sample consisted of 60 cadres, which was determined using a specific formula.

2.2. The Research Object Citeria

There are several criteria for selecting the research object. CHWs play a pivotal role in community-based health initiatives, especially in promoting child growth. CHWs are often frontline workers in community health posts, responsible for conducting anthropometric measurements at a minimum experinence of one year, such as measuring children's heights, measuring more than 20 children every month at the health post, and conducting recording and reporting, and aged 20-50 years.

2.3. Flowchart of the Research

Fig. 1 illustrates the sequential steps involved, including designing the tool, selection of the research population, implementation of anthropometric training using the modified length board, data collection, analysis, and interpretation of findings.

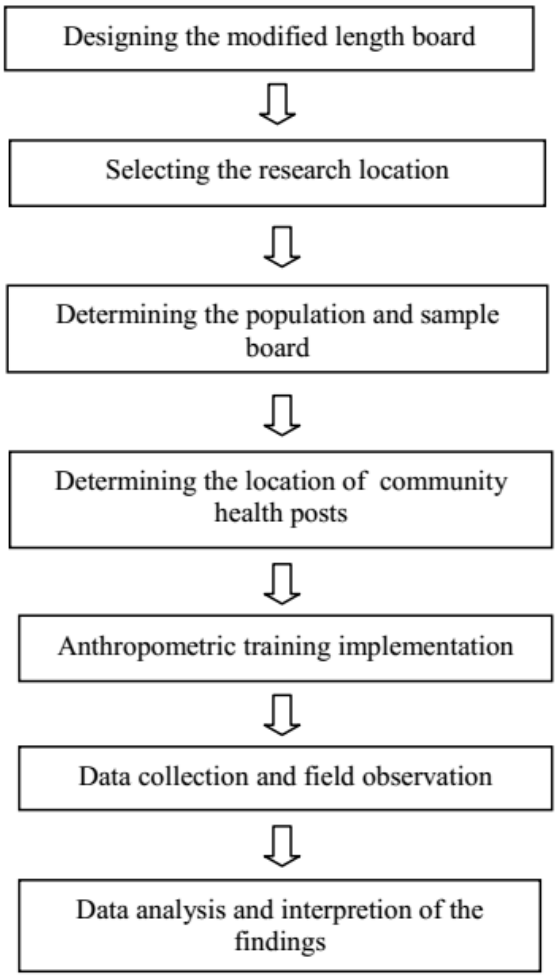

Fig. 1 Flowchart of the study (Developed by the authors)

2.4. Description of the Modified Length Board

The modified length board tool is a 35 x 120-cm board, featuring a headboard at the top and a reader board at the bottom (Fig. 2), with instructions for determining nutritional status on the right side (Fig. 3) and in the accompanying guide on how to take a measurement (Fig. 4).

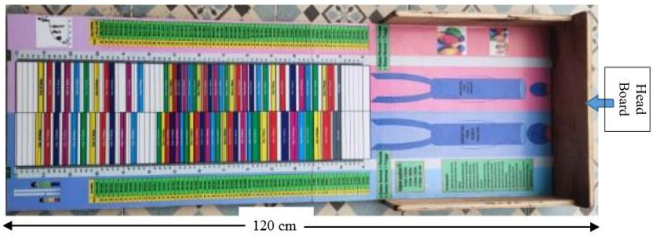

Fig. 2 The modified length board (Developed by the authors)

Fig. 3 Nutrition status (Developed by the authors)

Fig. 4 Taking measurements using the modified length board (Developed by the authors)

2.5. Data Collection and Analysis

Data on CHWs, mothers, child characteristics, cadre skills, physical measurements, and nutrition status were collected via questionnaires, observation, and height tools. The skills assessed included child positioning, result plotting, and nutrition status determination. The analysis involved frequency tables, a normality test to ensure group equality ($p > 0.05$), and bivariate analysis with chi-square tests to identify significant skill differences ($p < 0.05$) between the groups.

3. Results

3.1. Characteristics of Children in the Intervention and Control Groups

Table 1 indicates a higher number of boys than girls in the intervention and control groups, with a significant difference between them. The most common birth weight was 3.0-3.9 kg (55.0-60.0%). The age groups < 6 months and 6-12 months predominated. In both groups, 67.0-68.0% of children were 48.0-50.0 cm long at birth. Approximately 15.0% were underweight, and 3.0-5.0% overweight, according to anthropometric indices.

Table 1 Characteristics of the children (Developed by the authors)

Variables	Control group		Intervention group	
	n	%	n	%
Sex				
Boys	57	56.4	55	53.4
Girls	44	43.6	48	46.6
Birth weight (kg)				
< 2.5	7	6.9	6	5.8
2.5-2.9	29	28.7	32	31.1
3.0-3.9	60	59.4	57	55.3
> 3.9	5	5.0	8	7.8
Birth length (cm)				
< 48	16	15.8	20	19.4
48-50	68	67.3	70	68.0
> 50	17	16.8	13	12.6
Current age (month)				
< 6	28	27.7	30	29.1
6-12	24	23.8	26	25.2
13-24	22	21.8	21	20.4
25-36	16	15.8	14	13.6
> 36	11	10.9	12	11.7
Nutrition status				
Weight-for-age index				
Under-weight	16	15.8	15	14.6

Continuation of Table 1				
Normal	80	79.2	84	81.6
Over-weight	5	5.0	4	3.9
Height-for-age index				
Stunted	21	20.8	18	17.5
Normal	79	78.2	84	81.6
Tall	1	1.0	1	1.0

3.2. CHWs' Skills in Positioning a Child on the Length Board

Table 2 demonstrates that before training, only 41.70% of CHWs had proficient skills in child positioning, with similar rates in both study groups. Following the training, 91.7% of CHWs in the intervention group demonstrated enhanced proficiency in positioning children on the length board, and only 30-45% of CHWs in the control group marked a significant difference ($p < 0.001$) in the skills of the two groups following the intervention.

Table 2 CHWs' skills in positioning children on the length board (Developed by the authors)

Categories	**Before Intervention**		**Control**		***p*- value**	**After Intervention**		**Control**		***p*- value**
	n	**%**	**n**	**%**		**n**	**%**	**n**	**%**	
Positioning the head										
Good skill	25	41.7	25	41.7	0.839	55	91.7	27	45.0	0.000
Lack of the skill	35	58.3	35	58.3		5	8.3	33	55.0	
Positioning the legs										
Good skill	20	33.3	18	30.0	0.668	55	91.7	19	31.7	0.000
Not good skill	40	66.7	42	70.0		5	8.3	41	68.3	

3.3. CHWs' Skills in Plotting Height

Table 3 reveals that initially, the cadres' skills in height plotting was comparable across both study groups. After the intervention, a notable enhancement was observed; 91.6% of the cadres in the intervention group successfully mastered height plotting, in contrast to only 33.0% in the control group. This marked a significant difference in plotting skills between the groups ($p < 0.001$).

Table 3 CHWs' skills in plotting child height (Developed by the authors)

Category	**Before Intervention**		**Control**		***p*-value**	**After Intervention**		**Control**		***p*-value**
Plotting child height	**n**	**%**	**n**	**%**		**n**	**%**	**n**	**%**	
Correct	21	35.0	20	33.3	0.065	55	91.7	20	33.3	0.000
Incorrect	39	65.0	40	66.7		5	8.3	40	66.7	

3.4. CHWs' Skills in Determining Nutrition Status before and after the Intervention

Table 4 illustrates that before the intervention, there was no significant difference in CHWs' skills to assess nutrition status between the intervention and control groups ($p = 0.102$). Before the intervention, around three-fourth (75.0-78.0%) of CHWs could not determine child nutrition status correctly. However, following the implementation of anthropometric training, a higher number of CHWs in the intervention group demonstrated proficiency in assessing child nutrition status compared to CHWs in the control group ($p < 0.001$).

Table 4 CHWs' skills in determining nutrition status (Developed by the authors)

Categories	**Before Intervention**		**Control**		**p-value**	**After Intervention**		**Control**		**p- value**
Determining nutrition status	**n**	**%**	**n**	**%**		**n**	**%**	**n**	**%**	
Correct	15	25.0	13	21.7	0,102	50	83.3	20	33.3	0.000
Incorrect	45	75.0	47	78.3		10	16.7	40	66.7	

4. Discussion

This study highlights significant skill enhancements in cadres following targeted anthropometric training, underscoring training's role in knowledge and skill transfer for improved duty performance [22]. Often aimed at overcoming deficits linked to educational levels, such training effectively and efficiently boosts cadre performance [23]. In addition, CHWs are crucial for successful growth monitoring with precise tools. The intervention's positive impact on cadre skill accuracy aligns with similar findings across various countries [24-26].

This study focused on three key skills: child positioning on a length board, plotting measurements, and assessing nutritional status. For positioning, recumbent length measurements for children aged 0-60 months, as presented in Fig. 3, are recommended due to their reliability in reflecting linear growth [3], [24], [27]. The main challenge is ensuring accurate positioning by aligning the child's head with the headboard and straightening the knees and heels, as improper positioning can lead to height measurement errors and overestimation of growth and nutritional status [24], [28]. Errors were more common in the control group than in the intervention group, mirroring trends in other anthropometric studies [11], [16], [24], [29], underscoring the need for regular training of CHWs in height measurement techniques.

The significant changes in positioning children, reading measurement results, and determining

nutritional status suggest that the intervention had a substantial impact on CHWs' capabilities. This result aligns with previous studies emphasizing the importance of targeted training in enhancing the health proficiency of community health volunteers in anthropometric measurements [12], [26], [30].

The revelation of the meaningful comparison results between the modified length board and stadiometer underscores the reliability of the modified length board. This resonates with research advocating the development and use of context-specific tools that are practical and yield comparable results to standard equipment [31-33].

This study reported that the prevalence of stunting in the control and intervention locations did not differ significantly. Stunting was observed in 20.8% of children in the control locations and 17.5% in the intervention locations. Although there were no significant differences, it is important to acknowledge that stunting is still relatively high in the study areas. Stunting in Indonesia has emerged as a significant concern, prompting the government to set a target of reducing the rate from 26.4% in 2020 to 14.0% by 2024 [34]. However, a nutritional survey reported that the number of stunted children in Indonesia is still high, 21.4% [35], [36], compared to Thailand with 14.1% in 2018 [37] and Peru with 13.1% in 2016 [38].

4.1. Implications for Practice

The findings of this study have significant implications for maternal and child health programs at the community level, particularly in growth monitoring initiatives. CHWs play a crucial role in height and length measurements as part of growth monitoring programs. Therefore, ensuring proficiency in anthropometric measurements is essential for accurately determining the prevalence of stunting and providing timely interventions. The implementation of anthropometric training using context-specific measurement tools, such as the modified length board, can enhance the accuracy and reliability of growth monitoring programs, ultimately improving child health outcomes.

5. Conclusions

This study proved three important parts in measuring: 1) positioning the child on the length board, 2) plotting the results of height measurements, and 3) determining nutrition status. These have potential errors and become the main subject in anthropemtric training.

This study highlights the effectiveness of targeted anthropometric training in improving CHWs' skills in child height measurement and nutritional assessment. The findings contribute to the existing literature by emphasizing the importance of regular training and the use of context-specific measurement tools in community health programs. Therefore, it is recommended to include ongoing training for CHWs and continued efforts to address malnutrition and stunting in Indonesia.

Ethical Approval

This study received ethical approval from the Ethics Committee for Research (Ref. No. 01.1826/KEPK/Poltekkes Kemenkes Medan 2023).

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