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Comparison of the Effectiveness of Portable and Manual Digital Anthropometrics in Early Detection of Stunting in Children Literature Review

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ABSTRACT

Child growth is one of the most important indicators of public health and welfare. One of the serious challenges faced in child growth and development is stunting. However, tools for measuring stunting have weaknesses in accuracy, which are influenced by errors during measurement, age determination, accuracy of cadres, and non-standard anthropometric measuring instruments. For this reason, it is necessary to design a more practical anthropometric detection tool for child nutritional status for health practitioners and cadres, thereby reducing the risk of diagnostic malpractice due to human error. This study aims to identify stunting detection programs. This study employed a literature review method compiled based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Article searches were conducted on six databases, namely PubMed, Scopus, ProQuest, Medline, ScienceDirect, and other sources. The inclusion criteria for this study were articles published from 2018 to 2023 by populations worldwide. The quality assessment of studies in this research used the Joanna Briggs Institute (JBI) Critical Appraisal. The results of a study of eight articles obtained a digital tool for detecting stunted children, but one study demonstrated that the stunting detection tool is appropriate, portable, easy to use, and requires a short operating time

Keywords: toddlers, stunting detection, stunting, digital anthropometry

1. Introduction

Child growth is a crucial measure for assessing public health and well-being. A significant obstacle encountered in the process of child growth and development is stunting. According to the Indonesian Nutritional Status Survey (SSGI) carried out by the Ministry of Health, the stunting rate in Indonesia in 2022 was 21.6%. This number demonstrates a decline in comparison to the preceding year, which amounted to a fall of 24.4%. Although there has been a decrease, the incidence of stunting in Indonesia remains significant, given the government's goal of achieving a stunting prevalence of 14% by 2024. The WHO criteria require that the prevalence of stunting should not exceed 20% [1]

Stunting refers to a condition where children suffer from growth abnormalities caused by long-term malnutrition. It is determined by measuring anthropometric indicators, specifically when a child's z-score is below -2.00 SD (standard deviation) for height (stunting) and below -3.00 SD for weight (stunted weight) (Anthropometry is employed as a screening method in children to assess their health status, dietary

sufficiency, and growth and development trends. WHO uses four anthropometric indices, namely mass for age, height for age, mass for height, and body mass index (BMI) for age, to assess growth and development issues, particularly in toddlers. These indices are assessed over time to identify any abnormalities.[2]
Measuring the vertical distance from the ground to the top of the head while standing in children who are 2 years old and older and measuring the horizontal distance from head to toe while lying down in children under 2 years old enables the identification and tracking of stunted growth, malnutrition, and obesity in children worldwide[3] . To evaluate the nutritional health and growth patterns of children, precise data in the form of anthropometric measurements is required. In Indonesia, anthropometric measurements are often conducted using manual techniques involving tools like scales, meters, and measuring poles. The measurement mentioned above is characterized by prolonged duration, inefficiency, inaccuracy, biased measurement processes, and low dependability[2]. Mistakes might arise from improper measurement techniques, alterations in measurement outcomes, or errors in analysis. The potential sources of inaccuracy can arise from the use of measuring tools and challenges encountered during the measurement process [4]
Manual measuring of children's height and weight is frequently imprecise due to a multitude of circumstances. Furthermore, apart from human error, traditional measuring tools like electric scales and spring scales also exhibit lower levels of precision. Children frequently experience discomfort and fear throughout the process of being measured, which might disrupt the accuracy of the measurement results. The utilization of two distinct measuring devices further complicates and prolongs the measurement procedure [5].
Therefore, digital anthropometric measurements provide the most recent advancement in identifying stunting in children. This approach employs advanced techniques such as digital image analysis and computer-based data to accurately assess the physical measurements of children's bodies. Digital anthropometry has the capacity to provide more precise measurements, reduce time consumption, and offer more comprehensive data on children's growth and development compared to traditional approaches [6][7][8][9]
Therefore, the objective of this study is to examine previous research on the utilization of portable digital anthropometry for the identification of stunting in children. This article will investigate the most recent advancements, benefits, and obstacles of this technology in the prevention and management of stunting. This study evaluates the efficacy of digital anthropometry by comparing it to traditional anthropometric methods. It also analyzes the methodologies employed in prior studies and establishes potential guidelines for the utilization of this technology. Additionally, it aims to identify areas that necessitate additional investigation. The primary objective of this study is to enhance comprehension of how digital anthropometry might aid in worldwide endeavors to address stunting in children and provide guidance for future research in this fiel

2. Research methods

This study used a literature review method that was compiled based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) in Figure 1. Article searches were conducted on five databases, namely PubMed, Scopus, ProQuest, Medline, and ScienceDirect. Article search keywords were compiled based on the PICO Framework, and the keywords were Population: "Child," OR "under five years," OR "toddlers," OR "Children," OR "stunted children," OR stunted toddlers," OR "stunted toddler," OR "stunted child," "Intervention: AND "digital anthropometry," AND "electronic anthropometry," AND

"portable anthropometry," AND "digital anthropometry OR measurement," "Comparison: "traditional anthropometry."

3. Inclusion and Exclusion Criteria

The inclusion criteria for this study were articles published from 2018 to 2023, with a population of children aged up to eight years. The exclusion criteria were paid articles, textbooks, and articles using languages other than English and Indonesian. Articles that had been selected according to the inclusion and exclusion criteria were then assessed for quality using the Joanna Briggs Institute (JBI) Critical Appraisal according to the study design of the article. After that, the quality of the article was analyzed using descriptive analysis techniques, namely interpreting and explaining in more depth the results of the study and their relationships to each other through narratives.

4. Results and Discussion

Through a comprehensive search of six basic data, 1,055 initial references were obtained. After going through a screening process based on title and abstract and eliminating duplication, the number of articles that met the inclusion criteria was eight. These articles then underwent full-text analysis to be discussed in this literature search.

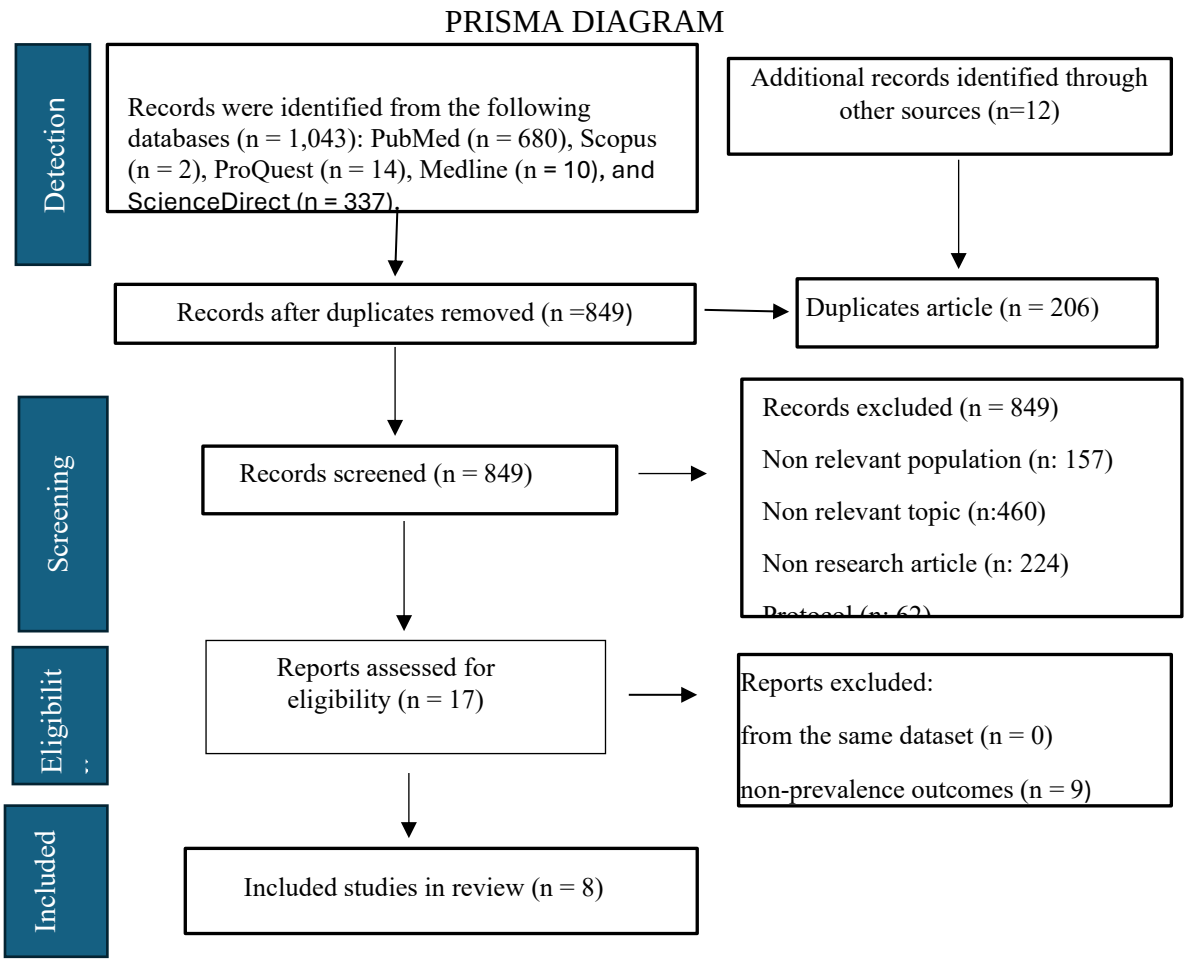

Figure 1 Prisma Diagram

From the selection results, eight articles were obtained that were in accordance with the research objectives, inclusion criteria, and exclusion criteria so that they were included in this study and could be continued to the quality research stage.

Data extraction

Table 1.1 List of Research References

No	Title	Study Design	Objective	Method	Results	Strength	Weakness	Differences with other studies
1	Study [2] *o*n the Development of a Multisensory-Based Non-Contact Anthropometry System for Early Detection of Stunting	Experimental studies with design development and testing	Developing a multisensory-based non-contact anthropometric system for early detection of stunting	A non-contact anthropometric system was developed using 3D sensors and RGB cameras. The system was tested on 100 children aged 2-5 years. Height, weight, and waist circumference data were compared with conventional anthropometric measurements.	The non-contact anthropometric system shows valid and reliable results for measuring height, weight, and waist circumference. This system is faster and easier to use compared to conventional anthropometry.	Non-contact anthropometric systems can help detect stunting in early childhood. This system is easy to use, can be used in remote areas, and is relatively inexpensive.	The research sample was small so further research is needed for this testing system in a larger population.	Umiatin's study focuses on the development of a non-contact anthropometric system tool that has the potential to be multisensory-based as an early detection tool for stunting in children aged 6-36 months, while researchers compare smart anthropo

								metry tools with conventional anthropometry as an early detection tool for stunting in toddlers aged 24-59 months.
2.	A study [10] on the evaluation of digital anthropometry compared to conventional anthropometry in 64 children aged 5-8 years	The evaluation study used a cross-sectional study design, qualitative research methodology, and a comparative experimental research design by comparing digital anthropometry with conventional	Comparing the accuracy and precision of digital anthropometry with conventional anthropometry in children aged 5-8 years.	**Cross-Sectional Analysis:** 64 children aged 5-8 years had their height and weight measured using two methods: Digital anthropometry, using 3D stereophotogrammetry software Conventional anthropometry, using stadiometers and scales **Comparison:** Height and weight measured by both methods	Height and weight measured by digital anthropometry were not significantly different from conventional anthropometry. Digital anthropometry showed comparable accuracy and precision to conventio	A fairly large research sample comparing two anthropometric methods directly and measuring various anthropometric parameters.	A cross-sectional study design was used. There was no information on the nutritional status of the children and no follow-up to see anthropometric changes.	The second study has different objectives and methods. Kennedy et al.'s (2022) study focuses more on comparing the accuracy and precision of two anthropometric methods, while the study to be conducted focuses

		anthropometry in 64 children aged 5-8 years.		were compared. Analysis Statistical analysis was performed to determine significant differences. **Analysis of Accuracy and Precision:** Accuracy and precision of digital anthropometry compared to conventional anthropometry	nal anthropometry for measuring height, weight, and waist circumference. Digital anthropometry is faster and easier to use than conventional anthropometry.			more on comparing the effectiveness of the two methods in early detection of stunting.
3.	Eva Liedman's (2022) study on the Accuracy of a Fully Automated 3D Imaging System for Pediatric Anthropometry in a Low-Resource Setting: Evaluation of	A randomized clinical trial (RCT) study design was used in a sample of 529 children aged 6-59 months.	Evaluating the accuracy of a 3rd generation automated 3D generation system (3D AnthroGen) for pediatric anthropometry in a low-resource setting	Children's height, weight, and arm circumference were measured using conventional anthropometry. Children were photographed using a 3D imaging system. Estimating 3D anthropometr	The 3D imaging system showed high accuracy for measuring height, weight, and arm circumference. The system is faster and easier to use compared to	The research sample is quite large. Comparing two anthropometric methods directly Measuring various anthropometric parameters	This study was conducted in a single location, so its generalizability is limited. There was no information on the nutritional status of the children. The cost of the 3D	The third study has a different purpose. Eva Liedman's study focuses on the accuracy of the 3D imaging system, while the study to be conducted focuses on

	Effectiveness in Malakal, South Sudan, in 539 children aged 6-59 months			y compared to conventional anthropometry measurements	conventional anthropometry.		imaging system is still relatively expensive.	comparing conventional anthropometric measuring instruments with Smart-Anthro in detecting early stunting.
4.	Research (Ludya, Herlambang and Yunidar, 2023) "Height and Weight Measuring Products to Detect Stunting with Entertainment Features in Children Aged 2-5 Years"	Design studies: Design thinking and ergonomic approaches	Developing a height and weight measuring tool product to detect stunting with entertainment features for children aged 2-5 years	The five stages of design thinking: empathize, define, ideate, prototype, and test The ergonomic approach is to ensure that the product is safe, comfortable, and easy to use.	Height and weight measuring tool products are shaped like changes with touch screens and entertainment features, such as animation and music. This tool can measure children's height and weight accurately	This product is innovative and interesting for children. This product is easy to use and accurate. This product can help detect stunting at an early age.	Production costs are still relatively expensive. Further research is needed to test the effectiveness of this product in increasing children's participation in anthropometric measurements.	The fourth study has different objectives and methods. The study by M. Ludya et al. (2023) focuses on the development of new measuring instruments, while the study to be conducted focuses on the

					and display the measurement results in a visual form that is attractive to children.			comparison of the two Smart-Anthro measuring instruments with conventional anthropometry as early detection of stunting in toddlers aged 24-59 months.
5.	A study (Ardianto, Elisanti and Husin, 2022) entitled Arduino and Android-based Anthropometric Detector Tools for Indonesian Children	Types of research and development	Developing an Android-based anthropometric measuring tool for Indonesian children	Designing and building hardware and software for Android-based anthropometric measuring instruments Testing the validity and reliability of anthropometric measuring instruments	Valid and reliable anthropometric measuring tool based on Android This measuring tool can be used to measure children's height, weight, and head circumference.	Strengths of the study include the innovative research design and the use of valid and reliable data collection methods.	This study was conducted on a small scale and needs to be tested on a larger scale, and this study has not measured the long-term impact of using anthropometric measurin	The fifth study has different objectives and methods. The research of Ardianto et al. (2022) focuses on the development of an android-based anthropometric

							g instruments.	measuring instrument, while the researcher focuses on comparing conventional anthropometric measuring instruments with Smart-Anthro in the early detection of stunting.
6.	A study (Gupta *et al.*, 2023) entitled The Impact of Anthropometric Training and 3D Imaging Feasibility on Anthropometric Data Quality in Children Under	- Prospective observational study - Conducted at 20 autopsy centers in 10 countries - Involving 100 infants who died suddenly	To evaluate the impact of anthropometric training and 3D imaging suitability on the quality of anthropometric data in toddlers in a postmort	- Participants were randomly divided into two groups: ○ The intervention group received training in anthropometry and 3D imaging of conformity. ○ The control group received no training.	- The intervention group had more complete, accurate, and precise anthropometric data compared to the control group. - Anthropometric training and 3D	- Prospective study design - Sufficiently large sample size - Standard anthropometric data measurements	- This study cannot prove a relationship because of the consequences between training and the quality of anthropometric data. - The generaliz	P. Gupta's research has different objectives and methods from other studies. P. Gupta's research focuses on improving the quality of

	Five Years in a Postmortem Environment		em setting.	Anthropometric data were collected by anthropometric officers using standard techniques. The quality of anthropometric data was assessed based on data completeness, data accuracy, and data accuracy.	imaging suitability improved the quality of anthropometric data in toddlers in the postmortem environment.		ability of the results of this study may be limited to the autopsy centers involved in the study.	anthropometric data in the postmortem environment, while researchers focus on early detection of stunting in toddlers.
7.	Research (Schoenau, 2019) on Anthropometric Measurements to Identify Malnutrition in Children with Cerebral Palsy in 328 children.	Retrospective analysis, where anthropometric data were collected prospectively	Identifying malnutrition in children with cerebral palsy using anthropometric measurements	Anthropometric data (weight, height, head circumference) of 328 children with cerebral palsy were analyzed. Anthropometric indices were calculated (BMI/U Z-score, height/U Z-score, and head circumference/U Z-score). The prevalence of malnutrition was calculated	Prevalence of malnutrition based on BMI/A Z-score: 15.2% Prevalence of malnutrition based on height/A Z-score: 8.8% Prevalence of malnutrition based on head circumference/A Z-score: 7.0% Risk factors for	Large sample study Using a number of anthropometric indices Risk factor analysis	Retrospective study design Anthropometric data were collected prospectively. Thus, there is a possibility of bias. There was no information on dietary intake.	The seventh study had different objectives, designs, samples, measurement tools, and outcomes. Schoenau's study focused on malnutrition in children with cerebral palsy, while the other

				based on anthropometric indices. Risk factors for malnutrition were analyzed.	malnutrition: age, gender, severity of cerebral palsy, and maternal nutritional status			study focused on early detection of stunting in toddlers.
8.	T. Siswati's (2023) research entitled Development of Non-Contact Detection in Stunting Children Using Ultrasonic Sensors	Experimental research, with pre-test and post-test design with control group	Developing a non-contact detection method for children with stunting using ultrasonic sensors	30 children aged 2-5 years were divided into two groups: The intervention group had their height measured using an ultrasonic sensor. The control group had their height measured using a stadiometer. The height data were compared between the two groups. The validity and reliability tests of the ultrasonic sensor were conducted.	Ultrasonic sensors show valid and reliable results for measuring children's height. Height measured with ultrasonic sensors is not significantly different from height measured with a stadiometer.	Contact method, safe and efficient Easy to use and can be used in remote areas Relatively low cost	The accuracy of the ultrasonic sensor can be affected by factors such as obesity and clothing. Further research is needed for this testing method in a larger population, and this is a better method.	In the tools used in stunting detection, T. Siswati's research shows that non-contact anthropometric measuring tools using ultrasonic sensors can be an effective tool for detecting stunting in children. The research to be conducted will test whether Smart-

								Anthro can be an effective measuring tool for detecting early stunting in toddlers.

Based on Table 1.1, eight articles review the development of digital anthropometry program interventions carried out in early detection efforts for stunting. There are five research articles (Umiatin et al., Samantha Kennedy et al., Efri Tri et al., Ibrahim Duran et al., and Priya M Gutra et al.) regarding tool development compared to conventional anthropometry, and three research articles (Eva Liedman et al., Michele Ludya et al., and Tri Siswati et al.) did not compare tool development with conventional anthropometry.

The development of digital anthropometry compared to conventional anthropometry

Seven of the eight research articles (Umiatin et al., Kennedy et al., Ardianto et al., Duran et al., Bidani et al., Liedman et al., and Michele et al.) compared the development of the tool with conventional anthropometry. Five of the seven research articles 8][2][11][10][1], showcased that measurements using digital anthropometry were more accurate in measuring body mass, height, and head circumference of children using the developed anthropometry compared to conventional anthropometry tools, with an error of <5% [2]. In addition, there is great interest in the acceptance of digital anthropometry and time savings compared to manual anthropometry [14][1], digital anthropometric measuring instrument has also been proven successful in transferring and estimating body shape measurements of children aged 5-8 years and is an accurate and consistent body circumference measuring instrument compared to manual measuring instruments [10]. Conventional anthropometric indicators such as BMI and height for age have poor performance in identifying malnutrition status in children with Cerebral Palsy [8] The development of a non-contact anthropometric measuring instrument with ultrasonic technology also provides more accurate reading results compared to reading a regular ruler scale (conventional anthropometry) with beige, light beige, and brown colors, thus providing a psychological impression, a sense of comfort, and warmth to children, and can calm children[7][15]

Out of the seven research studies, two indicated that the results were less precise, and a significant number of individuals in Nigeria favor traditional anthropometry over 3D imaging technology. Malnutrition is a major cause of death and illness in children under the age of five. Accurate anthropometric measures are crucial for identifying early signs of malnutrition and tracking child growth. According to the CHAMPS network analysis, nearly 90% of cases in children aged 1-59 months exhibited signs of malnutrition, suggesting a potential link between malnutrition and child mortality, either directly or indirectly. A study has shown that training in manual anthropometry resulted in enhanced accuracy of measurements. Additionally, while 3D imaging technology reduced the time required for measurements, participants expressed a general preference for manual anthropometry over 3D imaging technology[16]. In general, manual measures were more precise than measurements obtained using 3D anthropometric imaging. During the COVID-19 pandemic, this software shows promise on a large scale. However, several factors

can affect its performance. These include limited contact, the user's unwillingness to cooperate, adverse weather conditions, insufficient lighting in the room, overheating and shutdown of cellphones leading to inaccurate readings, and temperature fluctuations that can impact the accuracy of 3D transfer [6]

The development of digital anthropometry that is not compared with conventional anthropometry

One of the eight study publications (Tri Siswati et al.) exclusively focuses on the advancement of digital anthropometric tools and does not include a comparison between the development of the tool and traditional anthropometry. A child nutritional status detection method is developed based on the criteria of body length/age, body weight/height, and body weight/age. This android system generates nutritional status classifications, specifically normal, stunting, wasting, and underweight [8]

Discussion

This scoping review identified eight digital instruments that have demonstrated efficacy in determining the outcomes of height, weight, head circumference, arm circumference, and body mass index computations. Based on seven research articles, it has been found that digital anthropometry is a more accurate and efficient method compared to conventional anthropometry. Digital anthropometry offers the advantages of accuracy, portability, speed, and the ability to capture the interest of children and the general public. It has been observed that measurements obtained through digital anthropometry are more precise in determining body mass, height, and head circumference of children when compared to traditional anthropometric tools, with an error rate of less than 5%[2]. Furthermore, there is a significant level of enthusiasm regarding digital anthropometry and the efficiency it offers in comparison to manual anthropometry [8][14][1]. Anthropometry measuring instrument has demonstrated its efficacy in transferring and assessing body shape measurements in children aged 5-8 years. It has been found to be a precise and reliable tool for measuring body circumference, surpassing the accuracy and consistency of manual measuring tools [10]. Conventional anthropometric measures, such as BMI and height for age, are not effective in accurately identifying malnutrition in children with Cerebral Palsy[8]. A non-contact anthropometric measuring instrument utilizing ultrasonic technology offers more precise measurements compared to a conventional ruler scale (conventional anthropometry). The instrument is designed with beige, light beige, and brown colors, which create a psychological impression of comfort and warmth for children, ultimately helping to calm them (Michele et al., 2023). Utilizing the AutoAnthro system to get 3D scan data in children under the age of five for the purpose of calculating anthropometric measurements is generally considered appropriate, as stated by [15] in their study on manual anthropometric measurements.

Meanwhile, two study articles recently published the findings of a comparison between traditional anthropometry/manual anthropometry and digital anthropometry. This can be attributed to various things, one of which is the utilization of CHAMPS network analysis. Furthermore, nearly 90% of patients in the age group of 1-59 months exhibited signs of malnutrition, suggesting a potential correlation between malnutrition and child mortality, either directly or indirectly. Training in manual anthropometry has been shown to enhance the precision of measurements, and while 3D imaging decreases the time required for measurements, participants generally favored manual anthropometry over 3D imaging technology[12]. In general, manual measures are more precise than measurements obtained using 3D anthropometric imaging. During the COVID-19 pandemic, this software displayed promise on a broad scale. However, its effectiveness is influenced by various factors, including limited contact, user noncompliance, adverse

weather conditions, low lighting in the room, overheating and shutdown of cellphones leading to inaccurate readings, and temperature fluctuations affecting 3D transfer [6]

A recent study found that a device used to detect stunting in six-month-old infants accurately predicted the likelihood of stunting at three years of age [15] In addition, the HC-SR04 ultrasonic sensor and the GP2Y0A21 sharp IR sensor have the capability to accurately measure height, as demonstrated by [1] digital anthropometry is a more efficient and accurate method compared to traditional anthropometry. Body image scanners can produce accurate anthropometric measures within a matter of seconds, making them valuable tools in both commercial and research settings [17]. Moreover, varying equipment and techniques can be employed to acquire measurement items with varying degrees of accuracy and dependability [18]. Nevertheless, digital anthropometry is constrained by many limits arising from technology and human variability. The utilization of digital photogrammetry techniques is experiencing significant growth in order to fulfill the requirements of numerous applications across diverse fields [19] A separate investigation demonstrated that measurements of human body segments obtained using digital photogrammetry had a high level of concordance with the same level of precision [20]. The device used to measure the length of infants' bodies utilizes a sensor that is characterized using an equivalency regression method and is operated by an Arduino Mega 2560 microcontroller [21]

Moreover, traditional anthropometry is extensively employed in medical practice and epidemiological research to assess an individual's health [22]. Nevertheless, conventional methods simplify the intricate form of the human body by employing basic size measurements, enabling the acquisition of health indicators such as body mass index, height, and length [10]Utilizing digital anthropometry, specifically three-dimensional (3D) imaging, enables the precise and comprehensive measurement of external human body dimensions. This technology has the potential to outperform conventional measurement methods in healthcare applications [15], In addition, the utilization of anthropometry facilitated by mobile applications is readily available and economical, offering the ability to assess anthropometric measurements of clinical significance without the need for a skilled specialist [23]. Precise digital anthropometry assessments can aid in the detection of underlying medical, nutritional, or social issues in children[13] Furthermore, the utilization of digital anthropometric measuring instruments can efficiently identify stunting at an early stage. These instruments are user-friendly and portable, making them accessible for widespread use by the general public through community empowerment at Posyandu (integrated health service post)[8]

A significant number of study articles in the literature were carried out in controlled settings; hence, it is not justifiable to assume that the results obtained under these circumstances can be directly transferred in real-world situations, particularly in low-income nations. Additionally, it is important to consider external factors such as variations in weather and temperature, electrical connections, lighting, and the involvement of children in product design. These factors should be taken into account due to the higher cost of portable digital anthropometric devices compared to traditional anthropometry methods. As a result, it is unlikely that these devices will be widely adopted in diverse settings. Conversely, UNICEF has determined that mistakes in manual anthropometric measures arise due to errors such as misinterpretation from an incorrect perspective, challenges in reading measurements under inadequate lighting circumstances, and errors in manually entering data [3]. Avoiding this issue can be achieved by utilizing digital technology. It is crucial to have dependable data on child growth and development for public health programs. This can be accomplished by employing digital anthropometric devices that are both accurate and precise. These

devices are also reliable, portable, fast, appealing to children, simple, and user-friendly. Consequently, they have the potential to outperform traditional anthropometry methods.

The study's strength rests in its rigorous research procedure and methodology, precise tool specifications, and comprehensive intervention outcomes, enabling the presentation of results in accordance with the protocol. The researchers did a comprehensive search across several sources, including external sources. They performed screening, data extraction, and quality evaluation as part of their quality control measures. However, a drawback in studying research articles is that the reviewers did not actually test the instrument, instead relying solely on literature for analysis. This approach limits the scope of the assessment. The reviewed work does not provide a clear explanation of how anthropometric measurements in the child's supine position can impact the utilization of digital anthropometry tools in comparison to conventional anthropometry. The search approach, particularly the choice of databases, allows for a broad range of material to be obtained. Therefore, it is imperative to broaden the scope of the search to include additional databases, such as Embase, CINAHL, Global Health, and others. Furthermore, it is possible to get further literature information by amalgamating many synonyms for keywords. This approach can be employed to explore the broader scope of digital anthropometry in contrast to conventional anthropometry.

This review highlights the advancement of digital anthropometry in comparison to traditional anthropometry. An analysis of matching reveals the potential and crucial areas for enhancing the existing technologies. Several gadgets now remain in the prototype or early development phase and have not yet been modified for practical usage in the field or for commercial purposes. The authors argue that UNICEF's target product profile, which aims to find devices with significant potential for clinical and public health applications, has not been achieved and should be reevaluated through additional studies. While additional research funding is necessary to advance the development of the most promising devices, these new technologies continue to offer benefits such as being appealing to children, user-friendly, portable, easily transportable, safe for use by children, and applicable in the context of the COVID-19 pandemic when physical contact with patients is limited due to pandemic conditions, as opposed to traditional anthropometric measurements. Researchers should provide comprehensive and clear information regarding the accuracy, precision, and reliability of the tools used, including their specifications and operational requirements. They should also explain how the tools function and are utilized, as well as present the results of comparing these tools with conventional anthropometry. This is crucial for enhancing the early detection and monitoring of global nutritional status in children.

Conclusion

In general, significant gaps in child growth measurement tools with portable digital anthropometry compared to conventional anthropometry are highlighted. The high reliability and speed of measurement detection make digital anthropometry more suitable than conventional methods in certain contexts. This literature is able to achieve the main objective, namely to provide up-to-date information on the results of the comparison of portable digital anthropometry with conventional anthropometry, showing that portable digital anthropometry is more reliable, accurate, simple, time-saving, more attractive to children, and can be used in the management of COVID-19 pandemic conditions. During the COVID-19 pandemic, there is a restriction on contact with patients. Further development is essential to improve early detection and monitoring of child nutritional status globally. Further research is also needed to identify devices that have high potential for clinical and public health use according to the UNICEF target product profile criteria.

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Ethical considerations

Not applicable

Conflict of Interest

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