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The influence of the use of the SiANEH application on mothers' independence in monitoring the growth and development of toddlers

Pengaruh Penggunaan Aplikasi SiANEH terhadap Praktik Kemandirian Ibu dalam Pemantauan Tumbuh Kembang Balita

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ABSTRACT

Background: *Stunting is a significant health issue in Indonesia, affecting children's physical and cognitive development, as well as their future quality of life. One key strategy for preventing stunting is ensuring optimal monitoring of toddlers' growth and development.*

Objective: *This study examined the impact of the Android application "SiANEH" on monitoring growth, development, and stimulation, aiming to improve mothers' independent practices in stunting prevention efforts in Kutalimbaru Village, Deliserdang Regency.*

Methods: *A quasi-experimental design with a quantitative analytical approach was used, specifically a one-group pretest-posttest design. The research was conducted in Kutalimbaru Village, with a sample of 30 mothers of toddlers selected via purposive sampling. The study measured mothers' independent practices in monitoring growth and stimulating toddlers, utilizing the "SiANEH" app, which provides information on child development and reminders for stimulation. Data were collected through observation and completion of observation sheets. The research instruments were validated for content and reliability before application, and ethical approval was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Medan.*

Results: *The results revealed a positive and significant effect of the "SiANEH" app on child growth monitoring (r=0.532, p= 0.002), child stimulation (r=0.790, p= 0.000), and maternal independence in monitoring and stimulation (r=0.534, p= 0.002). Pretest scores for growth monitoring (1.57) and stimulation (1.60) increased significantly in the posttest (3.40 and 3.70, respectively), as did maternal independence (from 1.80 to 3.60).*

Conclusion: *These findings indicate that the "SiANEH" application enhances mothers' involvement in independently monitoring and stimulating child development, contributing to stunting prevention.*

Kata kunci*: android application SiANEH, child stimulation, growth monitoring, independence, stunting prevention*

ABSTRAK

Latar Belakang: Stunting merupakan masalah kesehatan serius di Indonesia yang memengaruhi perkembangan fisik dan kognitif anak, serta kualitas hidup di masa depan. Salah satu upaya utama untuk mencegah stunting adalah dengan memastikan pemantauan pertumbuhan dan perkembangan balita yang optimal.

Tujuan: Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan aplikasi Android "SiANEH" dalam memantau pertumbuhan, perkembangan, dan stimulasi anak,

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serta meningkatkan praktik mandiri ibu dalam pencegahan stunting di Desa Kutalimbaru, Kabupaten Deliserdang.

Metode: Desain penelitian ini adalah kuasi eksperimen dengan pendekatan analitik kuantitatif, menggunakan desain pretest-posttest satu kelompok. Populasi penelitian adalah seluruh ibu dengan balita di desa tersebut, dengan sampel 30 ibu dipilih menggunakan teknik purposive sampling. Variabel yang diukur meliputi praktik mandiri ibu dalam pemantauan pertumbuhan dan stimulasi anak, menggunakan aplikasi "SiANEH" yang memberikan informasi terkait perkembangan anak serta pengingat untuk stimulasi. Instrumen penelitian divalidasi isi dan reliabilitasnya sebelum digunakan, dan persetujuan etik diperoleh dari Komite Etik Penelitian Kesehatan Poltekkes Kemenkes Medan.

Hasil: Hasil penelitian menunjukkan bahwa penggunaan aplikasi "SiANEH" memberikan pengaruh positif dan signifikan terhadap pemantauan pertumbuhan anak (r = 0,532, p = 0,002), stimulasi anak (r = 0,790, p = 0,000), dan tingkat kemandirian ibu dalam pemantauan dan stimulasi (r = 0,534, p = 0,002). Skor rata-rata pemantauan pertumbuhan meningkat dari 1,57 (pretest) menjadi 3,40 (posttest), stimulasi anak meningkat dari 1,60 menjadi 3,70, dan kemandirian ibu meningkat dari 1,80 menjadi 3,60.

Kesimpulan: Temuan ini menunjukkan bahwa aplikasi "SiANEH" dapat meningkatkan keterlibatan ibu dalam pemantauan dan stimulasi perkembangan anak secara mandiri, yang berkontribusi pada pencegahan stunting.

Keywords: aplikasi Android SiANEH, kemandirian, pencegahan stunting, pemantauan pertumbuhan, stimulasi anak

INTRODUCTION

The Indonesian Minister of Health Regulation No. 66 of 2014 outlines growth and development care as the support given by healthcare professionals to young children, to enhance their physical, cognitive, mental, and psychosocial well-being. This care involves tracking the growth and development of toddlers, along with offering guidance to their parents. Adequate care can maximize the growth and development of young children, which in turn plays a significant role in the future development of the nation. Consequently, early investments in childhood are regarded as the most beneficial for the development of human resources [1], [2], [3].

To date, efforts to maximize child growth and development have included providing health education to families about the importance of monitoring child growth and development. Increasing parental independence in stimulating child growth and development is achieved through health education. Health education provided to parents is expected to foster interactions between parents as caregivers who provide stimulation and children who demonstrate responses to the stimulation, supported by the stimuli and objects used for this purpose [4], [5]. Parental involvement in childcare has excellent potential for development. Thus, parental potential in childcare can be optimized through the effective utilization of human potential and technological resources. In today's digital era, the potential for parental involvement is very high, strengthened by digital literacy [6]. However, mothers' active participation in monitoring their children's growth has decreased significantly. In this era, technological advancements are a factor that must be developed, especially in the health sector. One example of technological advancement that is now being widely developed in Indonesia is mobile applications. Applications can facilitate and simplify parents' ability to monitor their toddlers' growth and development quickly and accurately [7], [8].

Health education provided to parents is expected to foster interaction between parents as caregivers, who provide stimulation, and children who respond to the

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stimulation, supported by the objects used to provide [9],[4], [10], [11], [12]. Parental involvement in childcare has significant potential for child development. Thus, parental potential in childcare can be optimized through the effective use of both human and technological resources. In today's digital era, parental involvement has significant potential, strengthened by digital literacy. However, currently, mothers' active participation in monitoring their children's growth is limited[13],[14],[15].

The purpose of this study is to analyze the Effect of using the Android Application "SiANEH (Arihta Nilda Eva Herni)" for Monitoring Growth, Development, and Stimulation on Improving Mothers' Independent Practices in Monitoring and Stimulation as an Effort to Prevent Stunting in Kutalimbaru Village, Deliserdang Regency. The urgency in this study lies in the fact that Kutalimbaru Village is a foster village of the Midwifery Department at Medan Health Polytechnic. Many toddlers experience growth and development that is not appropriate for their age because one of the causes is the lack of knowledge of toddler mothers about nutritious food intake, parents give gadgets to their toddlers without any time limit, and their parents are also busy playing on smartphones, so parents do not provide developmental stimulation to their toddlers. Seeing the great benefits and interest in using Android smartphones, researchers are interested in designing an Android-based application that contains information about toddler growth and development that can be used easily, anytime and anywhere which is expected to be able to educate and motivate mothers to carry out independent monitoring of toddler growth and development and be able to help mothers to optimize their growth and development.

Health education media is a tool used by communicators to enable individuals to receive health information delivered through various media, including print, board, and electronic media. Educational media play two important roles in the learning process: as a tool to assist the teaching process and as a source of information for independent learning [16], [17], [18], [19]. The rapid advancement of technology has led to the widespread use of Android smartphones for most activities, including education and outreach. Besides being fast and convenient, Android smartphones provide a wide variety of up-to-date information. This has led to the use of Android smartphones not only as a means of communication but also as a medium for entertainment and education. Previous research has demonstrated that the use of smartphones as an educational medium is efficacious in improving public health [17], [20], [21].

Android is an operating system designed for mobile phones. Developers looking to create applications benefit significantly from this operating system, as it provides an open platform that allows them to build applications according to their specifications. In today's digital era, the potential for parental involvement is very high, strengthened by digital literacy. Currently, the rapid development of technology, coupled with the existence of social media, can simplify human life by providing technology and information services that facilitate socialization [7], [22]. According to the 2021 Digital Report Data, the total number of internet users in Indonesia was 202.6 million as of January 2021, representing 73.7% of the population. Additionally, internet access via smartphones accounted for 125.6%. This shows the large number of people in Indonesia who use the internet and smartphones.

This shows the large number of people in Indonesia who use the internet and smartphones. 2 Research conducted by the PEW Research Center (2018) revealed that one of the media most accessed by mothers is mobile devices or handphones. Therefore, efforts to increase knowledge through Android-based mobile phone applications are quite effective in providing knowledge, monitoring child growth and development, and also preventing stunting in toddlers. This study examines the impact

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of the Android application "SiANEH" on monitoring growth, development, and stimulation, aiming to improve mothers' independent practices in stunting prevention efforts in Kutalimbaru Village, Deliserdang Regency.

METHODS

Study design

This study employed a quasi-experimental design with a quantitative analytical approach, utilizing a one-group pretest-post-test design. The study was conducted in Kutalimbaru Village, Deli Serdang Regency, over a period of three months (June–September 2025). This design was chosen to analyze the Effect of the Android application "SiANEH" application on improving mothers' independent practices in monitoring their toddlers' growth and development, as well as stimulation, to prevent stunting. The one-group pretest-posttest design involves measuring the same variables (mothers' independent practices) before and after treatment (use of the SiANEH application). In this case, the pretest was conducted to measure the level of mothers' independent practices in monitoring their toddlers' growth and development before using the Application. In contrast, the posttest was conducted to measure the changes that occurred after mothers used the "SiANEH" Application for a specific period.

Data source and sampling procedure

This study involved all mothers with toddlers in Kutalimbaru Village, Deliserdang Regency, as toddlers represent a critical stage of growth and are highly vulnerable to nutritional problems such as stunting. The sample size of 30 mothers was determined based on the total number of eligible mothers with toddlers who met the inclusion criteria and agreed to participate during the study period, taking into account feasibility and the real conditions in Kutalimbaru Village. This sample is adequate to illustrate changes in mothers' practices within this group; however, it is relatively small for wide generalization, so the results should be viewed as preliminary evidence that needs to be confirmed in larger studies. Using a purposive sampling technique, 30 mothers of toddlers were selected based on specific inclusion criteria: having toddlers, owning smartphones capable of accessing the "SiANEH" application, possessing a Maternal and Child Health Handbook, and being willing to participate. Mothers who were out of town during the study period or unwilling to participate were excluded.

Variables of the study

The independent variable in this study was the use of the Android-based "SiANEH" application. The dependent variable was mothers' independent practices in monitoring growth, development, and providing stimulation to prevent stunting, measured before (pretest) and after (posttest) the intervention.

Data Collection

Data collection in this study followed a sequential flow starting from participant selection, pretest, intervention, and posttest. Eligible mothers who met the inclusion criteria were identified and invited to participate, then pretest measurements were conducted using the observation sheet to assess mothers' independent practices in monitoring and stimulating toddler growth and development. After the pretest, mothers received education and guidance on the use of the SiANEH application and carried out the intervention at home, followed by posttest measurements using the same instrument to evaluate changes in their practices.

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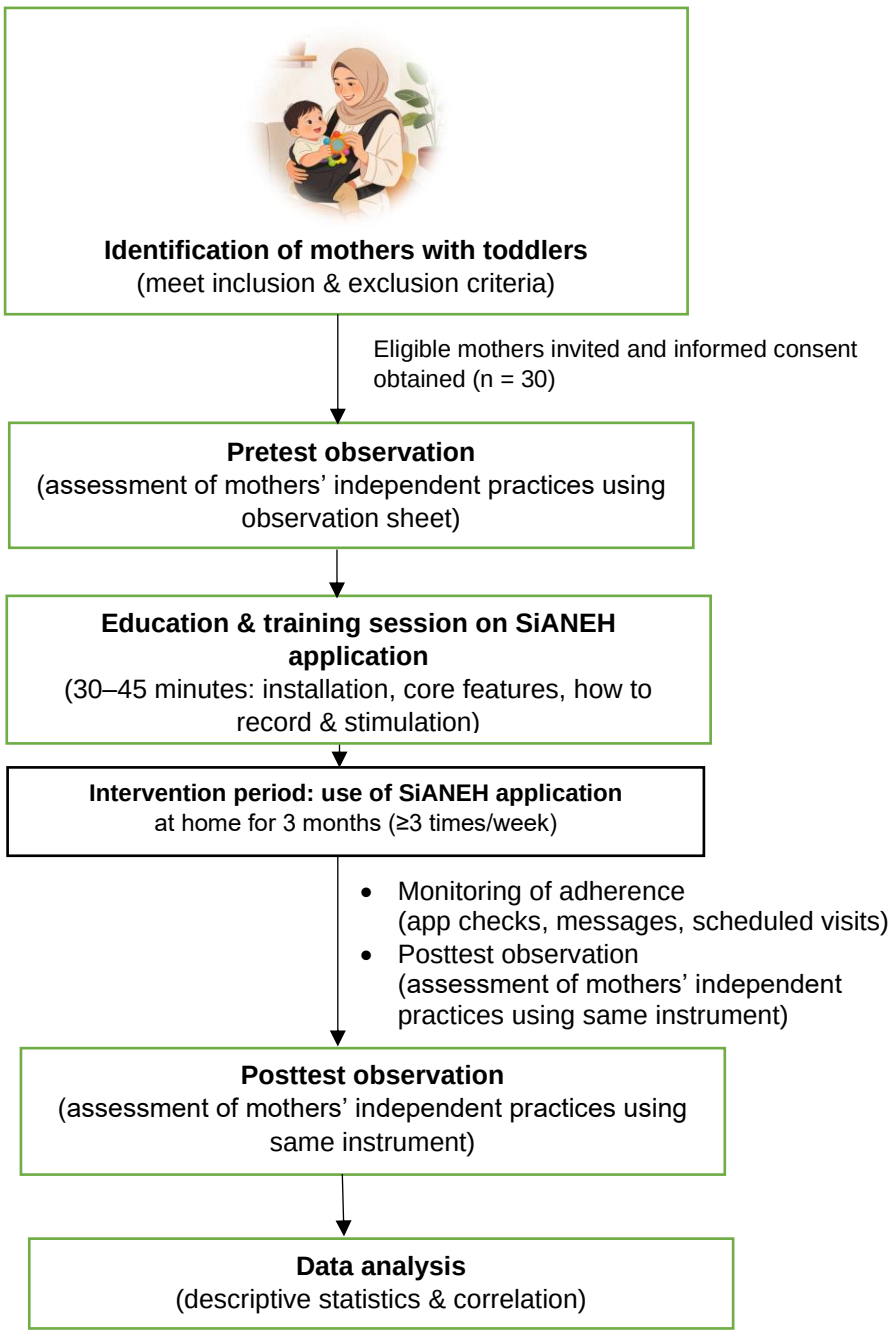

Figure 1. Research Flow

Measurement and Instrument

The observation sheet used to assess child growth monitoring, child stimulation, and the level of maternal independence was tested for validity and reliability before the main data collection. Construct validity was examined using item–total correlation, showing Pearson correlation values of 0.532 (p = 0.002) for SiANEH application use, 0.729 (p = 0.000) for child growth monitoring, and 0.748 (p = 0.000) for child stimulation. Reliability testing using Cronbach's alpha for all variables yielded a coefficient of 0.880, indicating good internal consistency. Mothers' independent practices were measured using a 4-point ordinal scale, where 1 = rarely, 2 = sometimes, 3 = often, and 4 = very often/every

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week. This scoring system was applied consistently in both pretest and posttest measurements.

Intervention Procedure

The SiANEH application intervention was conducted over three months. At baseline, mothers attended a 30–45 minute structured session led by researchers and health workers, including application installation, introduction to key features (growth monitoring, development monitoring, and stimulation guidance), and practical demonstrations. Only features directly related to the intervention were described.

Mothers were instructed to use the application at least three times per week to record growth and perform age-appropriate stimulation activities. Adherence was monitored through application checks and regular follow-ups via messages and scheduled visits, where mothers received reminders, motivation, and additional guidance when needed.

Description of SiANEH Application

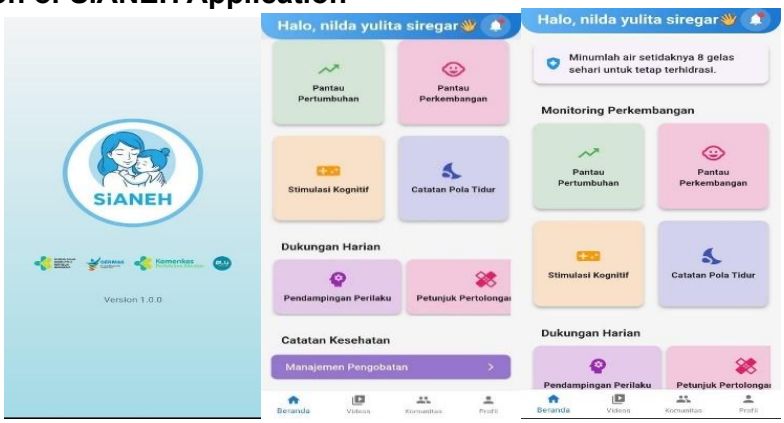

Figure 2. Aplication SiANEH

The SiANEH, which stands for Arihta Nilda Eva Herni. It is an Android-based application developed to assist mothers in independently monitoring and stimulating their toddlers' growth and development as part of stunting prevention efforts. The application includes several features, such as growth monitoring charts, developmental stimulation guidelines, educational materials on nutrition and health, and reminder notifications to encourage consistent use (Figure 2).

Ethical Consideration

Ethical approval for this study was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Medan (No. 01.26.2236/KEPK/POLTEKKES KEMENKES MEDAN 2025).

Data Analysis

Statistical analysis was conducted using SPSS version 25. Univariate analysis described respondents' characteristics (maternal age, education, number of children, and SiANEH usage) using frequencies, percentages, means, and standard deviations. A paired t-test was used to assess the effect of the intervention on mothers' independence in growth monitoring and stimulation, as the study applied a one-group pretest–posttest design with normally distributed continuous data. Pearson correlation was used to examine relationships between SiANEH usage and child growth monitoring, stimulation, and maternal independence. This approach enabled the analysis of changes over time and the identification of relationships between application use and key outcomes, providing insight into the effectiveness of the SiANEH application.

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RESULTS

Table 1. Characteristics of Subjects

Characteristic	n	Percentage (%)
Mother's Age		
18-24 years old	13	43
25-34 years old	14	47
35-44 years	3	10
45+ years	0	0
Number of children		
1 child	10	33
2-3 children	16	53
4 or more children	4	14
Last education		
Elementary/Middle School	4	13
High School/Vocational School	20	67
College	6	20
Total	30	100

Table 1 shows that most mothers were aged 18–34 years (90%), with the largest group 25–34 years (47%), followed by 18–24 years (43%). Only 10% were aged 35–44, indicating that participants were predominantly young mothers in the active parenting phase. Most had 2–3 children (53%), followed by one child (33%) and ≥4 children (14%), reflecting small to medium family sizes. In terms of education, 67% had completed high school, 20% had higher education, and 13% had elementary/junior high education, suggesting generally adequate educational levels for informed childcare and health decisions.

Table 2. Statistical Description of the Use of the SiANEH Application for Child Growth and Development Monitoring.

Variables	Mean	Std. Deviation P	Mean Difference (Pretest - Posttest)	Sig. (2-tailed)
Child Growth and Development Monitoring				
Before	1.57	0.504	-1.833	0.000
After	3.40	0.498	0.128	
Child Stimulation				
Before	1.60	0.498	-2.100	0.000
After	3.70	0.466	0.121	
Level of Independence in Monitoring and Stimulation				
Before	1.80	0.407	-1.800	0.000
After	3.60	0.498	0.121	

***** Paired Samples T-Test

Table 2 shows that the use of the SiANEH application significantly improved mothers' practices in child growth monitoring, stimulation, and independence (p=0.000). The mean score for growth monitoring increased from 1.57 to 3.40 (mean difference = -1.833), while child stimulation improved from 1.60 to 3.70 (mean difference = -2.100). Mothers' independence also rose from 1.80 to 3.60 (mean difference = -1.800).These findings indicate that the SiANEH application effectively enhances mothers' ability to independently monitor growth and provide stimulation, supporting better caregiving practices and contributing to stunting prevention. Table 3 shows that the mean score of the SiANEH application use was 3.50 (SD=0.509), indicating fairly frequent use. Child growth monitoring had a higher mean of 4.10 (SD=0.403), reflecting generally good

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practices. Pearson correlation analysis showed a significant positive relationship between application use and growth monitoring (r=0.532; p=0.002), indicating that increased use of SiANEH is associated with better child growth monitoring.

Table 3. Statistical Description of the Use of the SiANEH Application for Monitoring Child Growth

Variables	N	Min	Max	Mean	Standard Deviation	Pearson Correlation	Sig. (2-tailed)
Use of the SiANEH Application	30	3	4	3.50	0.509	0.532**	0.002
Growth Monitoring	30	3	5	4.10	0.403		

Table 4. Statistical Description of the Use of the SiANEH Application for Child Stimulation

Variables	N	Min	Max	Mean	Standard Deviation	Pearson Correlation	Sig. (2-tailed)
Use of the SiANEH Application	30	3	4	3.50	0.509	0.790**	0.000
Child Stimulation	30	4	5	4.47	0.507		

Table 4 shows that the mean score of SiANEH application use was 3.50 (SD=0.509), indicating frequent use, while child stimulation had a higher mean of 4.47 (SD=0.507), reflecting strong stimulation practices. Pearson correlation revealed a strong, significant positive relationship between application use and child stimulation (r=0.790; p=0.000), indicating that higher use of SiANEH is associated with increased stimulation provided to children.

Table 5. Statistical Description of SiANEH Application Usage on the Level of Independence in Monitoring and Stimulation

Variables	N	Min	Max	Mean	Standard Deviation	Pearson Correlation	Sig. (2-tailed)
Use of the SiANEH Application	30	3	4	3.50	0.509	0.534**	0.002
Level of Independence in Monitoring and Stimulation	30	2	5	3.33	1,028		

The results in Table 5 show that the use of the SiANEH application had an average score of 3.50 (SD = 0.509), indicating that most respondents used the application quite frequently. The level of independence in monitoring and stimulation had an average score of 3.33 (SD = 1.028), showing moderate independence among mothers with some variation between respondents. The Pearson correlation coefficient between the use of the SiANEH application and the level of independence was 0.534 with a significance value of p = 0.002, indicating a significant positive relationship at the 95% confidence level. This finding suggests that increased use of the SiANEH application is associated with higher levels of parental independence in monitoring and stimulating their children, demonstrating the app's potential as an effective digital support tool for enhancing parental engagement and self-reliance in child development activities.

DISCUSSION

The analysis shows strong evidence of the SiANEH application's positive impact on mothers' practices in monitoring and stimulating child development. Most mothers were aged 18–34 years (90%), indicating they are in the active parenting phase and generally familiar with technology. In terms of education, the majority had a high school level

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(67%), suggesting adequate literacy to understand and use Android-based applications. Only 13% had lower education, which may limit access to and use of technology. Effective health education is crucial in raising public awareness about healthy behaviors, disease prevention, and managing health conditions. Previously, health education was primarily conducted through face-to-face meetings or conventional counseling. However, with advancements in technology, health learning can now be delivered more interactively and flexibly through mobile applications, websites, videos, and social media. This enables individuals to access information at any time and from anywhere, while also providing a more engaging and practical learning experience [23],[24].

The Effect of Using the "SiANEH" Application on Monitoring Child Growth and Development

Statistical analysis showed a significant increase in child growth monitoring after using the SiANEH application, with mean scores rising from 1.57 to 3.40 (p=0.000), indicating improved maternal independence in monitoring weight, height, and head circumference. The application not only provides information but also reminders that encourage consistent monitoring and behavior change, which are important in preventing nutritional and developmental problems. These findings are supported by Kitsao-Wekulo et al., who developed a mobile application to monitor children's physical, cognitive, and social development. Their study in Kenya showed the app was well accepted by parents, though some technical challenges and limited understanding remained, indicating strong potential with the need for further development[3]. Irawan et al. evaluated pediatric digital health applications using the Mobile App Rating Scale (MARS). The study found that although many apps support child growth monitoring, their quality varies widely—some have strong user interfaces but lack content credibility and clinical validation[25].

The Effect of Using the "SiANEH" Application on Children's Stimulation

In addition to growth monitoring, the SiANEH application significantly improved child stimulation practices. The mean score increased from 1.60 (rare stimulation) to 3.70 after use, indicating that mothers more consistently provided cognitive and motor stimulation. Activities included puzzles, recognizing shapes and colors, and physical play such as ball games, supported by information and reminders from the app. The application helps mothers apply effective stimulation methods to support children's cognitive and motor development, especially during critical early years. Previous studies also show that structured and routine stimulation accelerates child development.

These findings are supported by Wei & Ming, who found that mobile learning applications enhance children's cognitive skills—such as memory, problem-solving, and attention—through interactive and educational activities[26]. This systematic review evaluates the impact of interactive technology on child development. The results indicate that the use of interactive technology can influence various aspects of child development, including cognitive, social, and emotional growth [27].

The Effect of Using the "SiANEH" Application on the Level of Mothers' Independence in Monitoring and Stimulation

One key finding of this study was the significant increase in mothers' independence in monitoring and stimulating their children. The mean score rose from 1.80 before the intervention—indicating reliance on health workers—to 3.60 after using the SiANEH application (p=0.000), showing greater independence. This suggests that the application functions not only as a reminder but also as an educational tool, helping mothers become more confident in identifying developmental signs and providing appropriate stimulation. These results are supported by research on the BabyMind application, which demonstrated that app use improves mothers' responsiveness and understanding of their child's needs, thereby enhancing maternal independence in supporting child

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development[28]. This study developed and tested the feasibility of a mobile application for monitoring child development. The app allows mothers to track developmental milestones, enhancing their engagement and independence in the monitoring and stimulation process [3]. However, differences in outcomes may arise from variations in application features and user populations. While BabyMind emphasizes emotional interaction and responsiveness, SiANEH focuses on practical guidance for growth monitoring and structured stimulation. These differences suggest that app design and content influence which aspects of maternal independence are improved.

Correlation Analysis Between Application Usage

A significant positive relationship was found between SiANEH application use and child growth monitoring (r=0.532), child stimulation (r=0.790), and maternal independence (r=0.534), with all p-values <0.05. This indicates that more frequent use of the application is associated with better maternal practices, with the strongest effect on child stimulation. The findings suggest that SiANEH acts as a facilitating tool by providing accessible education, reminders, and timely information that support independent caregiving.

This study highlights SiANEH as an innovative Android-based tool to enhance maternal independence in monitoring and stimulating child development. However, it is limited by its single, remote setting (Kutalimbaru Village). Despite this, the results have important implications for public and digital health, particularly in supporting stunting prevention programs. Future research should involve larger samples, control groups, and long-term evaluation, as well as integration into Posyandu and maternal–child health services.

These findings are supported by Kabongo et al., who found that mHealth interventions improve healthcare access and quality through education and reminders, but their effectiveness depends on context, system support, and user motivation[29]. Rinawan et al. developed a mobile application for Posyandu to record and report maternal and child health data. The study showed that the app significantly improved community health workers' knowledge and skills and was scaled to nearly 1,000 Posyandu. It concluded that a user-centered, iterative approach can effectively scale mHealth tools, although infrastructure and user adaptation remain key challenges [30].

The findings suggest that the SiANEH application can be integrated into routine maternal and child health services at Posyandu as a digital tool for growth monitoring, stimulation guidance, and strengthening maternal independence. At the program level, local health authorities and the Ministry of Health could pilot and scale its use in high-stunting areas through Posyandu and primary care networks, supported by training for cadres and midwives. In the long term, SiANEH can complement existing services with real-time reminders and education to enhance stunting prevention efforts.

However, this study has limitations. The one-group pretest–posttest design without a control group limits causal inference, and the small sample from a single village (Kutalimbaru) restricts generalizability. Future studies should use larger, more diverse samples and stronger designs, such as randomized controlled trials, to validate these findings.

CONCLUSION

The findings indicate that the SiANEH application is associated with increased frequency of mothers' practices in monitoring child growth and providing stimulation, as shown by higher post-intervention scores. Its use also correlates positively with maternal independence, suggesting its potential to enhance engagement in early childhood care and support stunting prevention in community settings.

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Future research should use more robust designs, such as randomized controlled trials, to better assess causal effects. Studies should also explore integration into Posyandu and primary health care services, while evaluating adherence, usability, and long-term sustainability. Additionally, testing in diverse populations and refining features based on feedback from users and stakeholders are needed to optimize its role in national stunting prevention programs.

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