

The Design of an Android-Based "BERAKSI" Application for Early Detection of Stunting

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ABSTRACT

Stunting is a condition of failure to thrive in children under five years of age (toddlers) due to chronic malnutrition and recurrent infections. Children are classified as stunted if their length or height is below minus two standard deviations of the size or height of children their age. Stunting handling must synergize between ministries/institutions, regional governments, and the business world/community. This study aims to help cadres and parents monitor the growth and development of typical toddlers in general and stunted toddlers in particular by using the *BERAKSI* Application. The method used in compiling this application is "Waterfall," a sequential software development process starting from planning, modeling, implementation (construction), and testing. The stages in developing the waterfall method are requirements (needs analysis), system design, coding and testing, program implementation, and maintenance. The results of the application compilation research, namely *BERAKSI*, display four menu features, including 1) Growth, 2) Development, 3) Balanced Nutrition, and 3) Parenting. The advantage of the *BERAKSI* Program application compared to similar applications is that it has updates in the form of interventions providing balanced nutrition for toddlers who experience stunting and malnutrition with menus that have been consulted and recommended by nutritionists, as well as having a parenting menu that has been consulted and advised by child psychologists. Field data input into the *BERAKSI* application can be saved and downloaded on Google Spreadsheet. The *BERAKSI* application can be downloaded without paying via Playstore using an Android-based mobile device connected to the internet network.

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INTRODUCTION

Stunting is a condition of failure to grow in children under five years of age (toddlers) due to chronic malnutrition and recurrent infections, especially during the window of opportunity, from the fetus to the child age of 23 months. Children are classified as stunted if their length or height is below minus two standard deviations of the size or height of children their age. (International Food Policy Research Institute, 2014). Stunting and other malnutrition that occur in the window of opportunity, in addition to the risk of hampering physical growth and children's vulnerability to disease, also cause obstacles to cognitive development, which will affect the level of intelligence and productivity of children in the future (Ministry of Health RI, 2018).

Addressing stunting has become a priority target both globally and in Indonesia. National Medium Term Development Plan 2020-2024, reducing the prevalence of stunting in children

under five, has become one of the major projects with a target of 14.00% in 2024 (Makripuddin, 2021). Achieving this target requires hard work by the government and various parties. Even though it has shown a significant reduction compared to the prevalence of stunting from the 2018 Basic Health Research, which was 30.80% (Ministry of Health, 2021), the results of the 2021 Indonesian Nutrition Status Study still show that the prevalence of stunting among children under five in Indonesia was 24.41% (Ministry of Health RI, 2022). The efforts made by the government to achieve the target of reducing the prevalence of stunting by 2024 have issued Presidential Regulation of the Republic of Indonesia Number 72 of 2021 concerning the Acceleration of Reducing Stunting. The Presidential Decree explains that the accelerating stunting reduction in Indonesia is carried out holistically, integratively, and with quality through coordination between parties (President Republic Indonesia, 2021).

According to West Java data, the prevalence of stunting in West Java in 2023 was 21.7%; this figure has increased compared to the previous year, which was 20.2%. Data on the prevalence of stunting in Bandung Regency in 2023 was 29.2% (Open Data Jabar, 2023). Efforts to accelerate stunting reduction include specific nutritional interventions and sensitive nutritional interventions. Specific interventions include activities implemented to address the direct causes of stunting. Good nutrition at the window of opportunity is essential in optimizing growth and development. Inappropriate feeding practices in providing breast milk and weaning foods can influence the incidence of stunting (Central Bureau of Statistics, 2021).

Reducing stunting focuses on addressing direct and indirect causes. Referring to "The Conceptual Framework of the Determinants of Child Undernutrition" (UNICEF, 2013), "The Underlying Drivers of Malnutrition" (International Food Policy Research Institute, 2014), and "Factors Causing Nutritional Problems in the Indonesian Context" (Ministry of National Planning and Development/National Planning and Development Agency, 2018), the direct causes of nutritional problems in children, including stunting, are food consumption and infection status. The indirect causes include the availability and patterns of household consumption, parenting patterns for providing breast milk/weaning food, psychosocial parenting patterns, provision of weaning food, cleanliness and sanitation, health services, and environmental health. It is hoped that intervention against direct and indirect causes can prevent nutritional problems, both undernutrition and excess nutrition. Stunting prevention requires integrated nutritional interventions, including specific and sensitive nutritional interventions. Global experience shows that implementing integrated interventions to target priority groups in priority locations is the key to improving child nutrition growth and development and preventing stunting (Levinson et al., 2013).

Stunting handling must synergize between ministries/institutions, regional governments, and the business world/community. Afifah Primary Clinic is a private clinic in Arjasari Village, Banjaran District, Bandung Regency. Budi Luhur Institute of Health Sciences Cimahi has collaborated with Afifah Clinic since 2013. The form of cooperation that has been carried out so far is sending students to carry out practices, especially midwifery, research facilities for lecturers and students, and community service. Afifah Clinic has a vision of "Making the best Primary Clinic in West Java in 2030" with a focus

on the service objectives that the Al Ikhlas Nawawi Foundation wants to achieve, namely providing health services to improve the health of the community by prioritizing the broadest possible social function. Afifah Clinic's services include maternal, infant, and toddler services, family planning health services, and home care. The Midwifery Study Program of Budi Luhur Institute of Health Sciences Cimahi has a vision of "Providing Midwifery Services in the Community by utilizing information technology." Based on this background, Budi Luhur Institute of Health Sciences Cimahi makes Afifah Clinic a partner in implementing the *BERAKSI* program application.

Applications for checking stunting and toddler development have been widely found in the Play Store and can be used by the public. Research conducted by Zianka et al. (2023) on the design of android applications for calculating food nutrition to prevent stunting with the CNN method in Jakarta found the "MobileNetV2" model, which can contribute to high accuracy values and can run safely and smoothly on Android applications. With this application, parents in Indonesia will be more aware of their children's nutrition, be able to maintain their diet, and monitor their children's daily nutrition to avoid stunting. Another study explains that the application can increase knowledge about stunting detection, which can make it easier for mothers of toddlers to identify children with the potential for stunting, solutions for mothers of toddlers if their children have the potential for stunting and provide an evaluation of the success of stunting interventions through the Sidimes application (Fahmi et al., 2020).

The *BERAKSI* program application is that it can be used by integrated service post cadres, mothers with toddlers, and health workers to detect stunting early. The *BERAKSI* program application also has updates in the form of interventions for providing balanced nutrition for toddlers who experience stunting and malnutrition, with a menu that has been consulted and recommended by nutritionists and a parenting menu that has been consulted and recommended by child psychologists. Data inputted into the *BERAKSI* program application can be saved and downloaded on a Google spreadsheet. Integrated Service Post Cadres can use this data to send monthly reports to the Health Center.

The *BERAKSI* (with cadres to overcome stunting) program application is expected to help and make it easier for cadres and parents to monitor the growth and development of typical toddlers in general and stunted toddlers in particular. Cadres can conduct inspections on integrated service post activities, and parents can

monitor the development of babies and toddlers at any time through the application on their respective smartphones. The *BERAKSI* program application offers early detection of stunting using an application on a smartphone that can be used easily and at any time by parents, cadres, and health workers. The *BERAKSI* program application displays four menu features, namely the inspection feature: 1) Growth, 2) Development, 3) Balanced Nutrition, and 3) Parenting. Compared to similar applications, the advantage of the *BERAKSI* program application is that it has updates in the form of balanced nutritional interventions for toddlers who experience stunting and malnutrition with menus consulted and recommended by nutritionists. It has a parenting menu that child psychologists have consulted and recommended. The data columns

inputted into the *BERAKSI* program application can be saved and downloaded in Google Spreadsheet.

METHOD

The method used in preparing this application is Waterfall. The waterfall method is a sequential software development process that starts with planning, modeling, implementation (construction), and testing. The stages in developing the waterfall method are requirements (needs analysis), system design, coding and testing, program implementation, and maintenance. The ethical number in this research is 026/D/KEPK-STIKes/X/2023.

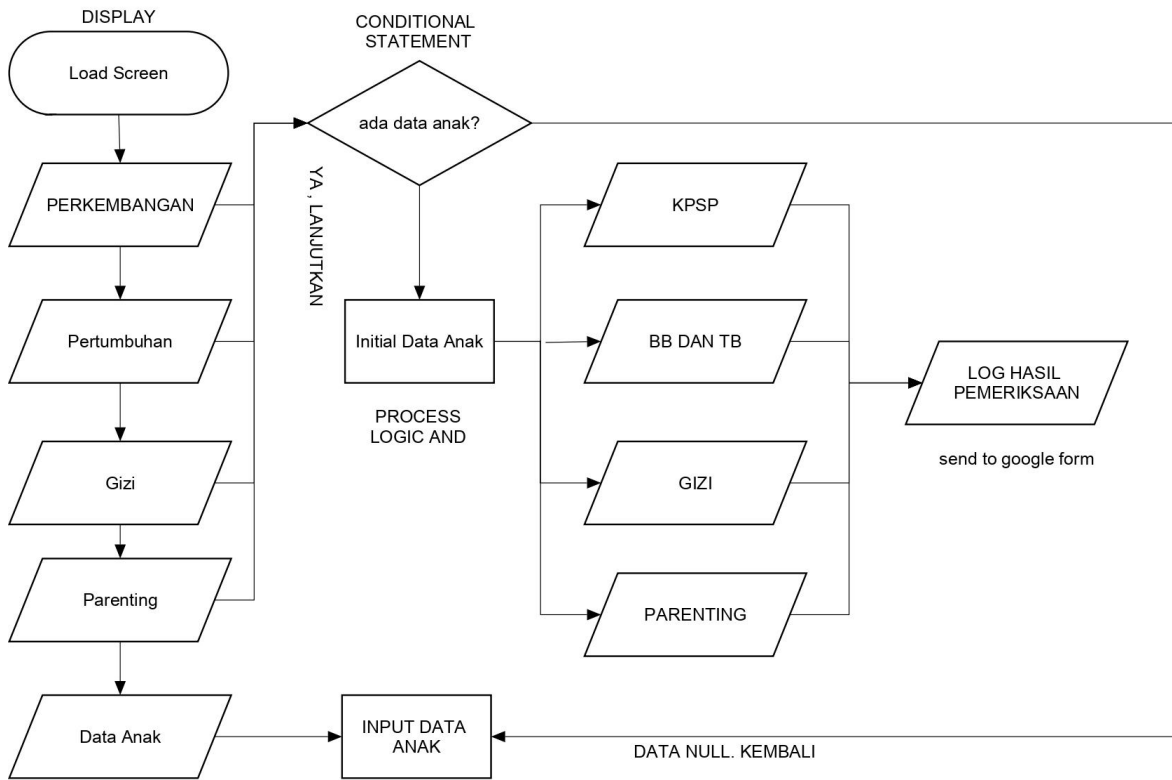


Figure 1. Application Testing Flowchart

The waterfall stages in application development are:

1. Requirement (needs analysis): An analysis is conducted to compile the application's features at this stage. The system needs analysis study was conducted with an initial survey and interviews with the Afifah Clinic, the Bandung Regency Health Office, the Cimaung Health Center, and Bandung Islamic University Psychologists.
2. The system design is carried out by translating software requirements into a UML (Unified etc) diagram design to facilitate software development.
3. Coding: The coding stage is arranged according to the needs analysis and design needed to create the *BERAKSI* program application.
4. Testing is carried out to determine whether the functions in the program run according to the specifications required by the user and admin. This system testing is carried out in 2 ways, namely by conducting internal and external testing. Internal testing is carried out using the black box and white box trial methods that focus on the functionality of the system being built. External testing is carried out, with the first user test being carried out in the Afifah Banjaran Clinic Work Area and the second user test being carried out at Integrated Service Post Bina Sehat, Lebakwangi Village, Kec. Arjasari, Bandung Regency.
5. The Program was implemented at the Afifah Banjaran Clinic on the day, adjusting to the infant-toddler immunization schedule.
6. Budi Luhur Institute of Health Sciences Cimahi performed maintenance to ensure the application could be downloaded and run well.

RESULTS

Table 1. Functional testing of *BERAKSI* application features

Test scenario	Case Test	Expected result	Testing result	Conclusion
Black Box Screen Profile Testing				
<i>Input Identity, height, weight and Date of Birth</i>	Baby Name, Parents Name, Height, Weight and Date of Birth	The system saves it in Tinydb and displays it in the home menu	Expected	Valid
Results of Black Box Testing Module KPSP				
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displays KPSP Questions 0-3 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displays KPSP Questions 3-6 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displays KPSP Questions 6-9 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displays KPSP Questions 9-12 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 12-15 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 15-18 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 18-21 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 21-24 Months	Expected	Valid

Test scenario	Case Test	Expected result	Testing result	Conclusion
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 24-30 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 30-36 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 36-42 Months	Expected	Valid
Displays Questions according to the input saved from Tinydb screen Profile	Tinydb Get Value Data2 =	Displaying KPSP Questions 42-48 Months	Expected	Valid
Black Box Height Test Results				
Displaying the form according to the height inputted from tinydb Tinydb	Tinydb Get Value Data2 =	Displaying the results of average weight, obesity, and thinness information	Expected	Valid
Black Box Weight Test Results Box				
Displays the form according to the body weight inputted from Tinydb	Tinydb Get Value Data2 =	Displays the results of information on average weight, height, and shortness	Expected	Valid
Black Box Testing Nutrition Module Testing Results				
Displays PDF according to the age inputted from Tinydb	Tinydb Get Value Data2 =	Displays the nutritional stimulation pdf page according to age	Expected	Valid
Black Box Parenting Testing Result				
Inputting 16 questions from the parenting pattern questionnaire	Inputs check-boxes A b c d	Displays the results after being inputted in the form of the most extensive maximum parenting pattern	Expected	Valid

Based on the table 1, the functional features of the *BERAKSI* application have been validated and can be used. Below is a display of the

BERAKSI application if it has been downloaded on a smartphone and used for examination.



Figure 2. Front page display of the *BERAKSI* program application



Figure 3. Baby features and profile display

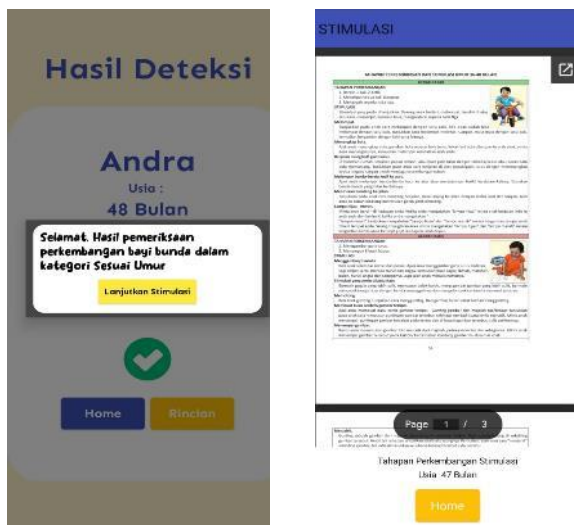
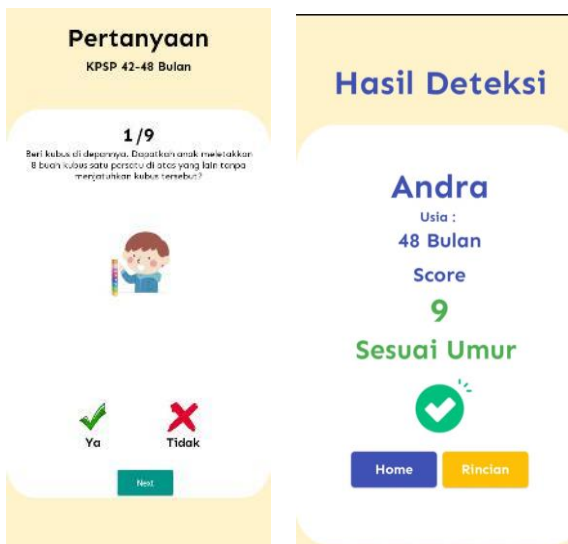


Figure 4. Developmental check results

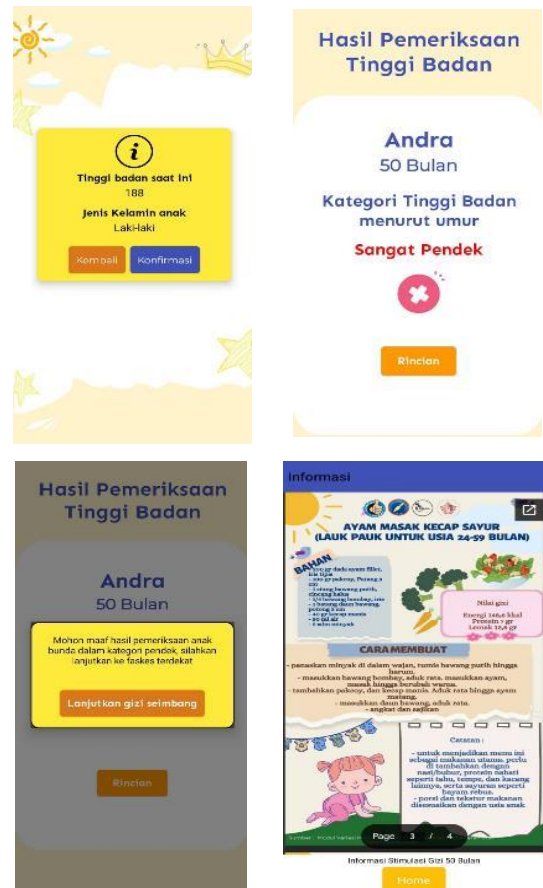


Figure 5. Results of growth examination

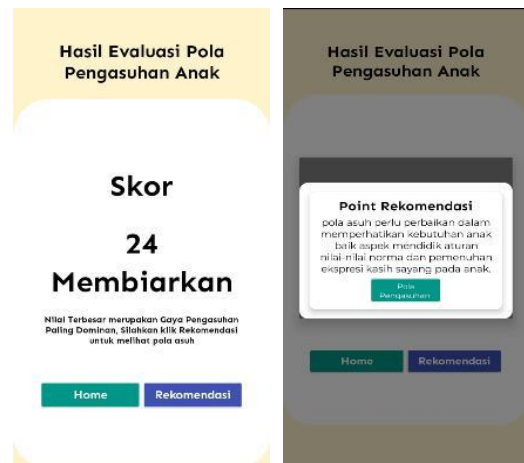


Figure 6. Parenting features

DISCUSSION

The *BERAKSI* program application has four features that are very interesting and useful for its users and are easy to use. These features include:

1. Growth features
The growth feature is used to check Body Weight and Height
2. Developmental features
Using the Developmental Pre-Screening Questionnaire, the Development feature is used to carry out Stimulation, Detection, Early Growth, and Development examinations.
3. Balanced nutrition features
This feature contains a balanced nutritional menu and instructions on preparing it, taken from library sources. Parents can try this balanced nutritional menu at home and have received recommendations from nutritionists at the Cimaung Health Center, Bandung Regency.
4. Parenting features
This feature contains parenting education material, which can help increase parents' knowledge of raising children, and self-assessment, which can provide an overview of assessing children's parenting patterns. This parenting education material was prepared directly by lecturers at the Faculty of Psychology, Unisba (Islamic University of Bandung).

The *BERAKSI* program application can be used easily and at any time by parents, cadres, and health workers to conduct checks on Growth, Development, Balanced Nutrition, and Parenting to increase parents' knowledge. The *BERAKSI* application can be used in Integrated Healthcare Center activities, making it easier for cadres to carry out growth and development checks and for health workers to educate parents. Research conducted by Condeng et al. (2023) on 40 nutrition cadres increased the ability to use the Android-based mobile prevention application after being given an explanation by the Team and nutrition officers about nutrition and stunting; participants were given direct training on how to use the Android-based stunting prevention application utilizing direct simulation by nutrition cadres and after downloading the participants immediately practiced how to use the application "PREVENT STUNTING".

Research by Terttiaavini (2024) found that the Bunda Care Application can be an innovative solution for monitoring child growth to overcome stunting. This application has achieved its goals by making it easier for parents to record their child's development, providing relevant educational

information, and providing proactive warning notifications. Research on the Development of an Android-based stunting Monitoring and Evaluation Information System Application (Case Study: South Central Timor Regency) conducted by Letuna & Pakereng (2023) can be concluded that 1) The existence of this application helps the stunting examination process in the South Central Timor Regency area; 2) The application created can help speed up the stunting examination process and treat children who experience stunting symptoms displayed in the application; and 3) This application can help the community understand the importance of child nutrition for child development.

The parenting feature can help parents increase their knowledge about parenting patterns for babies and toddlers. The *BERAKSI* program application aims to assist Integrated Healthcare Center cadres in the early detection and monitoring of growth and development in toddlers who experience stunting in helping parents implement a balanced nutritional menu that can be prepared directly at home (Susanti et al., 2022)

The *BERAKSI* program application has been tested twice to ensure the application can be used and to find system problems or errors so that improvements or additions can be made according to the findings. The first trial was conducted in the Afifah Banjaran Clinic Work Area, while the second was at the Bina Sehat Integrated Healthcare Center, Lebakwangi Village, Arjasari Subdistrict, Bandung. In the testing process, system constraints or errors become material for improvement in terms of material and appearance. Based on the results of the trials and improvements, the subsequent socialization of the *BERAKSI* program application was carried out at the Pratama Afifah Banjaran Clinic, and the result was that the application could be used well.

CONCLUSION

The *BERAKSI* program application can be downloaded without paying via Playstore using an Android-based mobile device connected to the internet network. The *BERAKSI* program application can be helpful for the community (cadres, mothers who have babies under five) because it can be used in integrated healthcare centers and at home to carry out examinations and monitoring, provide balanced nutrition, and increase mothers' knowledge in providing care for babies under five, including *Asah*, *Asih*, and *Asuh*.

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