

SIMANTAP POLITA: Mobile Health Technology-Based Child Growth Monitoring & Stimulation Application

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ABSTRACT

Background: The child population in Indonesia in 2018 was 27.6% of the total population. Child is a development asset that requires large investments in health, education, and welfare for a better future. Therefore, innovation is needed in monitoring and stimulating children's growth and development.

Method: The application design used was the waterfall method. The design stage started from analyzing user needs, application design, coding, and testing.

Results: SIMANTAP application consists of two modules, namely 1. Monitoring and Stimulation of growth and development in children and 2. Additional Information. The application starts from the login page, main page, and content page.

Conclusion: Information technology can provide opportunities for the advancement of modern health care. This opportunity can be exploited by increasing the knowledge of parents' attitudes and behavior regarding monitoring and stimulation of growth and development in children. This technology can help health workers provide evidence-based health information and can assist parents in monitoring and stimulating children's health.

Keywords: [Monitoring; Stimulation; Child Growth; *M-Health*]

INTRODUCTION

The total population of Indonesia in 2018 based on data from the Central Bureau

of Statistics (BPS) was 264.2 million people, 30.1% of that number consisted of children and adolescents (79.55 million people). The population of children less than 5 years old is 27.6%, which is 21.9 million people. This population is a development asset that requires investment in health, education, and welfare for a better future¹. The commitment of the Indonesian government in the 2030 Sustainable Development Goals (SDG's) for children's health is to eliminate poverty in children, no children are malnourished and die from diseases that cannot be treated, create a child-friendly environment, provide education for children and early childhood and other targets¹. Education and care for children from birth to the age of 6 years has a significant effect on the growth, development, and learning potential of children in the future². Parents and families are expected to provide and protect children's rights to be able to grow and develop properly.

Currently, one of the main problems in low-middle-income countries is the growth of children who are delayed, which is about 250 million children aged less than 5 years at risk of not being able to achieve maximum growth³. Disruption of growth and development in children will contribute to morbidity throughout the life cycle of children, transmission of poverty between

generations, and in the long term, it can restrain the pace of development of a country. Given that children are an important element for the sustainability of the nation and state, creating a superior generation from an early age is absolutely necessary¹.

Various methods of monitoring and stimulating children's growth and development have also been attempted. The government makes the MCH Handbook as a medium of information for parents to monitor and stimulate the growth and development of their⁴. The results of other studies have also produced many new methods for monitoring and stimulating children's growth and development, including using leaflets, posters, WhatsApp groups, and smartphone applications^{5,6,7,8,9,10,11}. The results of the studies state that parents need new methods to increase knowledge, attitudes, and behavior in monitoring and stimulating growth and development in children⁶.

Based on these results, this study aims to build an application for monitoring child development by parents or families independently based on mobile technology. This application is tremendously important to help parents know, stimulate, evaluate, and detect early growth and development in children. The results of the study indicate that mobile technology has a positive effect on parents and health workers in monitoring children's health, among others, increasing the knowledge of parents and health service providers regarding child growth and development, as well as increasing interactions between parents and health workers, increasing the role and confidence of parents in carrying out child care activities^{5,6,11,12,13,14,15}.

LITERATURE REVIEW

a. Growth and Development on Children

The critical period for children is in the first five years of life. Children need early experience and basic education for good brain development in children's lives¹⁶.

Creating superior children in the future does not happen in one time, but it must go through a long and continuous process, namely from the first 1000 days of human life (Central Bureau of Statistics, 2020). Therefore, efforts to monitor and stimulate optimal child growth and development are needed, not only physically, but also social-emotional abilities, learning abilities, and numeracy literacy.

b. Growth and Development Monitoring on Children

Monitoring a child's growth from birth is a common practice to detect developmental failure and its association with undesirable factors. The results of this monitoring form the basis for taking corrective actions that can be used to prevent or reduce nutritional disorders as well as chronic diseases and infections in childhood. Anthropometric measurements are important indicators to predict infant health. This method is most suitable for evaluating the nutritional and general health status of the community. Infant weight, height/length and head circumference are considered the most common parameters for monitoring a child's physical growth^{18,19,20}.

Four interrelated areas in child development are physical aspects, cognitive aspects, linguistic aspects, and socio-emotional aspects. Physical development is defined as an individual's growth rate, physical fitness, fine motor skills, gross motor skills, and capacity to take care of oneself. Chronic malnutrition is a predictor of lower cognitive and overall development in early childhood and later in life. Cognitive development is progress in analytical skills, mental problem solving, memory, and early math skills. Three-year-old child should be able to solve simple problems and match colors and shapes, as well as be aware of concepts such as "more" and "no". Linguistics or language development is manifested by infants through babbling, pointing, and gesturing, then saying the first words and phrases to word explosions between the ages of 2-3

years. The capacity to absorb language and distinguish sounds appears around 9 months, before a child begins to speak. Therefore, it is very important that parents and caregivers verbally interact with children from birth. Socio-emotional development in the first 2 years of life occurs through the relationship of children and caregivers. This acquisition fosters socio-emotional development in preschool children, which is expanded to include social competence, behavior management, social awareness, and self-control skills^{18 21 22}.

Monitoring and stimulation of children's growth and development is a long-term investment to create superior human resources. Failure to provide nutrition and stimulate growth and development will have an impact on deviations in the child's growth and development, or the occurrence of permanent disturbances until the child's future¹⁷.

c. Mobile Health (M-Health) Technology

These information and cellular technology opportunities can be utilized for modern healthcare solutions. Advances in information technology can improve cellular function for health, which is known as M-Health^{23,24}. The M-Health application is a solution to health problems by utilizing mobile applications on mobile phones, smart watches, wireless sensors or tablet computers. The existence of M-Health is expected to help change a person's positive health behavior, help someone live a healthy lifestyle, and can help treat diseases or support diagnosis^{25,26}.

The results of the study have mentioned many benefits of M-Health technology for the advancement of health care, namely empowering patients and their families in independent health care and treatment, facilitating access to health services as well as preventive, promoting, and rehabilitative health services^{24,26,27}. This technology has also been widely used for

children's health. Various studies have stated that the use of M-Health technology has a positive effect not only on the health of children, but also for parents and health workers²⁵. The forms of technology used are mobile applications for monitoring child health, mobile applications for interaction between mothers and midwives, as well as applications for health workers^{5,10,11,12,13,15, 29,30}.

MATERIALS & METHODS

The method used to design software is the waterfall method. This method is one of the SDLC (System Development Life Cycle) models which is also called a linear sequential^{31,32,33}. The stages used in the development of this application are:

a. User need analysis (*Analysis*)

The analysis process is the process to understand the needs of an application to be built. The analysis process is through literature review and interviews. The output at this stage of analysis is in the form of user needs consisting of physical data (in the form of documents) and non-physical (interview results).

b. Application design (*Design*)

The analysis results of software requirements are transformed in the form of diagrams to facilitate communication with software developers for coding.

c. Program coding (*coding*)

The application design is poured into a programming language so that it can be understood by the computer system. The programmer transforms the diagram into the form of program codes, namely the Java language. Android-based applications are coded by using supporting software, namely Android Studio and JDK (java development kit).

d. Software testing (*testing*)

The application usage testing stage is carried out to find out whether the application built is in accordance with the design and user needs. Application testing

uses the blackbox test method that focuses on application functions, errors in the interface, database system errors, performance errors, and initialization and termination errors.

The user type of the SIMANTAP POLITA application is parents/family/caregivers. The main users who use this application are parents/family/caregivers who have children aged 3 months to 5 years.

RESULT

SIMANTAP POLITA is an Application for Monitoring and Stimulation of Growth and Development in Children. The application can be downloaded at <http://simantap.politati-server.com/>. This application contains monitoring and

stimulation of child growth and development and additional information related to child development, such as dental care, sick child care, daily child care and other information. The purpose of making this application is that parents can monitor growth and development in children independently wherever and whenever not limited to space and time.

SIMANTAP POLITA is built by using the Android-based Flutter framework. Flutter is an open source technology from Google that can be used to create Android and iOS applications. Flutter is a Software Development Kit (SDK) so it is equipped with useful features for developing cross-platform applications.

Guideline Use of SIMANTAP POLITA

a. Homepage



Figure 1: List Page



Figure 2: Login Page

b. Main Page



Figure 3: Main Page

The login page will appear when the user first downloads the SIMANTAP POLITA application. Users who do not have an account can create an account by clicking the “Register Now” button as shown in Figure 1. Users who already have an account can directly enter using the registered email and password as shown in Figure 2.

The main page contains two main sections, namely Stimulation of Child Development and additional information related to child development.

c. Growth Monitoring and Stimulation Page

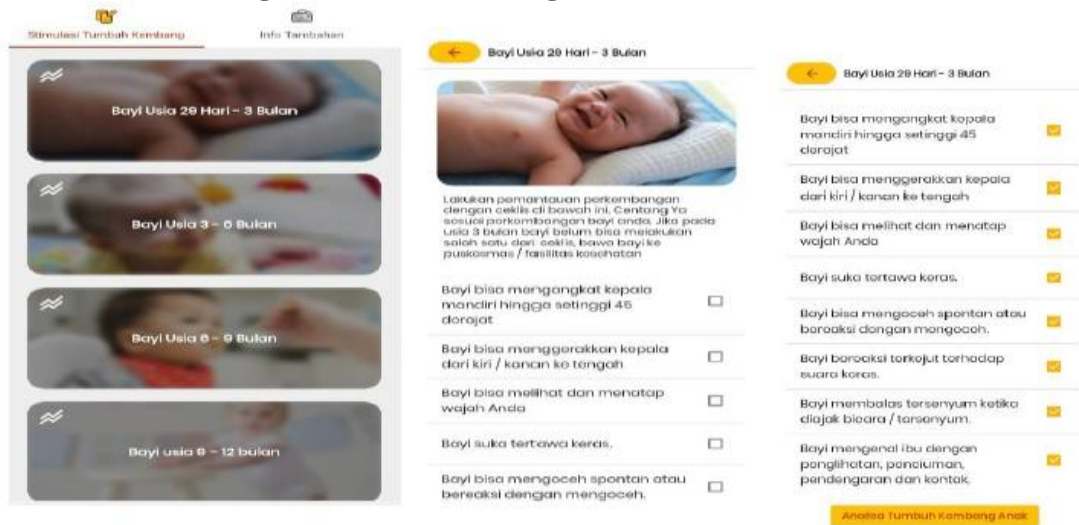


Figure 5:Monitoring Child development

The Growth Stimulation page contains categories for monitoring the age of babies from 29 days to children aged 5-6 years. In this Growth and Development monitoring, the user can independently examine the child according to the child's age category. If at that age the baby/child has not been able to do one of the growth and development monitoring checklists, then the baby/child can be taken to the community health center/health facility.

d. Additional Info Page

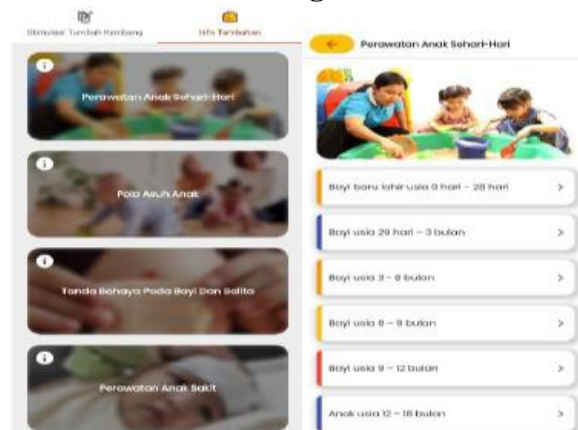


Figure 7:Additional Info

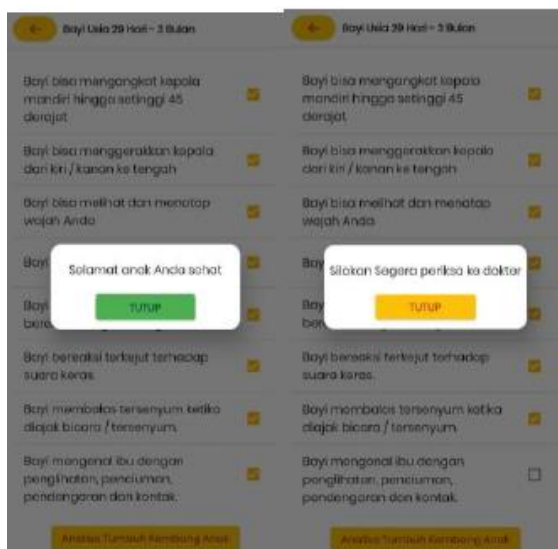


Figure 6:Child Stimulation Monitoring

The additional info page contains information related to children's growth and development, namely:

1. Daily child care
2. Parenting
3. Sick child care
4. Immunization
5. Meeting children's nutritional needs
6. Child Development and Islam
7. Danger Signs in Children
8. Children's Dental Care

The difference between this application and other existing applications is that in this application, there is a Menu for Child Development and Islam. Through this application, parents can add Islamic knowledge to teach children about morality, *aqidah* (behavior), and Islam.



Figure 8: Child Development and islam

DISCUSSION

The stages of growth and development in children are the most important phases which are the main goals for the child's future. In the golden period of child growth and development, there will be a developmental spike that must be maximized with thorough stimulation in all aspects, both cognitively, socially emotional, numerical and physical literacy. Monitoring and stimulation of growth and development in the child will be absorbed by the child's brain during this period. Therefore, maximum effort is needed to achieve optimal growth and development^{17,34,35}.

Many efforts must be made to prepare a superior generation. The Indonesian government has also emphasized the importance of children's health in the Regulation of the Minister of Health of the Republic of Indonesia No. 66 of 2014 concerning monitoring growth and developmental disorders of children. In Article 6 it is stated that monitoring of growth, development and developmental disorders in children must be carried out thoroughly and of good quality by means of adequate stimulation, early detection of growth disorders and deviations, as well as early intervention for growth and development disorders in children⁴. Therefore, innovations and new methods are

needed for modern health care for children. The new method is expected to help increase the knowledge, attitudes and behavior of parents in monitoring and stimulating children's growth and development.

The industrial revolution 4.0 has made the internet inseparable from human life. The internet has become a powerful communication medium to provide information directly to its users (Association of Indonesian Internet Service Providers, 2020). The use of information technology and the internet continues to increase. The results of the Indonesian Internet Service User Survey (APJII) for 2019-2020 stated that internet users experienced an increase of 8.9% from the previous year, namely in 2018-2019 by 64.8% and internet users in 2019-2020 as many as 73.7%. The survey results also state that as many as 95.4% of internet users use smartphones/mobile³⁶.

The rapidly increasing use of information technology and the internet has created many new technologies that can be used in everyday life, including in the world of health, known as Mobile Health Technology. Internet and technology can make it easier for people to access health services in low-resource environments³⁷. These advances can open up opportunities that can address global challenges in the health sector that can provide effective solutions to solve health problems such as diagnostics, medical procedures and access to medical information³⁸.

The M-Health application can be an innovation and solution to improve children's health. On-line-based M-Health technology by utilizing electronic devices such as smartphones or tablet computers can make it easier for health workers and parents to monitor and stimulate growth and development in children without being limited by space and time²⁴. Other research results for M-Health also state that this technology can increase a person's confidence and skills for health care, increase knowledge about health, facilitate interactions between individuals and health

workers, and can make it easier for health workers to provide health information without being limited by space and time 5,10,11,12,13,15,28,29,30

CONCLUSION

Information technology can provide opportunities for the advancement of modern health care. This opportunity can be exploited by increasing the knowledge of parents' attitudes and behavior regarding monitoring and stimulation of growth and development in children. M-Health for children's health provides benefits not only for children, but also for parents and health workers by utilizing advances in information technology and the internet. It is hoped that parents and health workers can monitor and stimulate children wherever and whenever it is not limited to space and time.

Strategies in monitoring and stimulating children's growth and development can take advantage of information technology opportunities. This technology can help health workers provide evidence-based health information and can assist parents in monitoring and stimulating children's health. Future researchers can take advantage of this opportunity to make other innovations to improve children's health.

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