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Research paper

Motubang: A Mobile Application to Monitoring Children Growth and Development Status

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Abstract

Children's growth and development is crucial point that must be monitored by each parent to prepare a healthy and resilient generation, especially during the golden period (0 – 3 years). Unfortunately, many parents cannot monitor the child, either because of busy or lack of awareness. Based on Indonesia Ministry of Health, 1.1 Million of Indonesian child under five years, experienced growth and development disorder, and many of it caused by late of identification. In this paper, we propose Motubang - a mobile application for monitoring children's growth and development. With this mobile application, problems and developmental disorders can be detected at an early stage so that appropriate interventions can be done. This research involve parent who have children aged 0 – 6 years, and medical team in Puskesmas Cibiru Hilir. Motubang is the tools project for Cross-Sectional Study to find correlation of nutritional status and the development of children in age 0 – 6 years in Puskesmas Cibiru Hilir.

Keywords: *Growth and Development Child, Monitoring, Mobile Application*

1. Introduction

According to WHO, growth, and development of child is a blend of quantitative and qualitative aspect. Growth is a qualitative process such as gaining weight, gaining height, accretion of head and chest, while the development is the structural and functional changes in motoric movement. Growth and development of child can be derived into four aspect, gross motoric aspect, fine motoric aspect, personal – social aspect, and the most fundamental aspect is language and speech.[2][6] All of this aspect should be balanced in a child's growth and development. The imperfection of a child's growth will result in a variety of disorders that brought at further developmental periods.

The growth and developments of child affected by internal factor (hormone, genetics) and external factor (prenatal, intranatal and postnatal).[7][13] Prenatal factors includes nutrition during pregnancy, mechanical/fetal position, toxins/chemicals, endocrine disorders, infectious diseases, immunological disorders and psychological mother. Intranatal factor includes a history of childbirth that causes trauma to baby that causing damage to the brain tissue, such as the vacuum action. Postnatal factor involve nutrition, chronic diseases / congenital abnormalities, physical and chemical environment, psychology, medicine, social, economic, environmental care, stimulation, and drugs. Among all these factors, nutritional status is one of the factors which influenced the growth and development of children. Malnutritions would hamper the growth in children, in consequent, the proportion of body structures become incompatible with his age, which in turn will have implications for other aspect.[6] Malnutrition at the age of 2 years will cause reducing brain cells about 15% - 20%, thus led the child having 80% -85% quality of the brain later in his life.[14]

Based on Indonesia Ministry of Health, 1.1 Million of Indonesian child under five years, experienced growth and development disorder, because of malnutrition.[5] To minimize it, government has taken action since the '50s were marked by the slogan "Empat sehat, Lima sempurna", in the' 90s, the government has also doing the movement to improve nutrition, by campaigns "Kampanye Gizi Seimbang dan Keluarga Sadar Gizi" (balanced nutrition and family aware of nutrition), and in 2012 with aim to enhance the improvement of children nutrition, the government made a national movement called the "Gerakan Nasional Percepatan Perbaikan Gizi dalam rangka Seribu Hari Pertama Kehidupan"(National Movement to Accelerate Nutrition Improvement in order Thousand First Day of Life". It was done to reduce the rate of malnutrition in Indonesia.[10] Having made several attempts to make a movement to improve children nutrition, according to the Global Nutrition Report (GNR), Indonesia has hardly make any progress in reducing levels of child malnutrition, which launched by Indonesian government together with UNICEF and other partners since 2007. GNR found that 37 percent of children under five suffer from stunting in Indonesia due to malnutrition.[11] While Richard D. Semba reported, the prevalence of stunting in families in Indonesia was 33•2%. In Indonesia, greater maternal and paternal formal education led to a decrease the odds of child stunting. High levels of maternal and paternal education were both associated with protective caregiving behaviors, including vitamin A capsule receipt, complete childhood immunizations, better sanitation, and use of iodised salt.[13] Equivalent to the report to Dr. Richard D. Semba, Profile Kesehatan Indonesia (Indonesia Health Profile) also shows irregularities infant growth and incidence of malnutrition caused by lack of monitoring. Community participation, especially the mother in a child's growth measurement is very important in the early detection of malnutrition cases. Participation of mothers in a child's growth measurement decreased in 2015, one of the factors that leads to a de-

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crease infant growth monitoring in health centers is due to ignorance of mothers towards their children measurement the benefits in health centers. Thus, lack of parent education can led unmonitored growth and development of child that caused stunting.[10]

In order to solve the problems we propose Motubang, to assist parents in monitoring the nutritional status and growth in children, is to build applications for monitoring the nutritional status and child development, both in nutrition and immunization. So that this application is expected to facilitate parents in monitoring the nutritional status and their children's growth.

2. Discussion and conclusion

The main objective of this work was to build mobile application for monitoring children's growth and development, and a tools for collecting data in Cross-Sectional Study to find correlation of immunization status, nutritional status and the development of children in age 0 – 6 years in area of Puskesmas Cibiru Hilir. Our grand-design was shown in Figure 1. To achieve the objectives of this study, this research was conducted using User Centered Design method. User Centered Design (UCD) is a framework that puts the user at the center of the system development process. The concept make the user is focus of the existing system and system was designed based on the experience and needs of users in the user view (the user interface). [1][3]

The primarily step was to identification the user needs. It's done by observation and interview with the medical team in Puskesmas Cibiru Hilir and some parents who have children ages 0-6 years. From observations and interviews it's found that the child growth and development monitoring is done by using a test Deteksi Dini Penyimpangan Tumbuh Kembang (DDPTK). The test obtained by using the child's age, body weight compared with the child's height and head circumference as the variable. While the detection of developmental disorders of children using Kuisioner Pra Skrining Perkembangan (KPSP) or pre-screening questionnaire development, hearing and vision tests. List of Deteksi Dini Penyimpangan Tumbuh Kembang (DDPTK) tests was shown in Figure 2. In this study the detection of developmental disorders of children only use the pre-screening questionnaire development or Kuisioner Pra Skrining Perkembangan (KPSP). The results of interviews with parents, found they needed tools to do reminders when to monitor growth and development and a timetable for immunization.

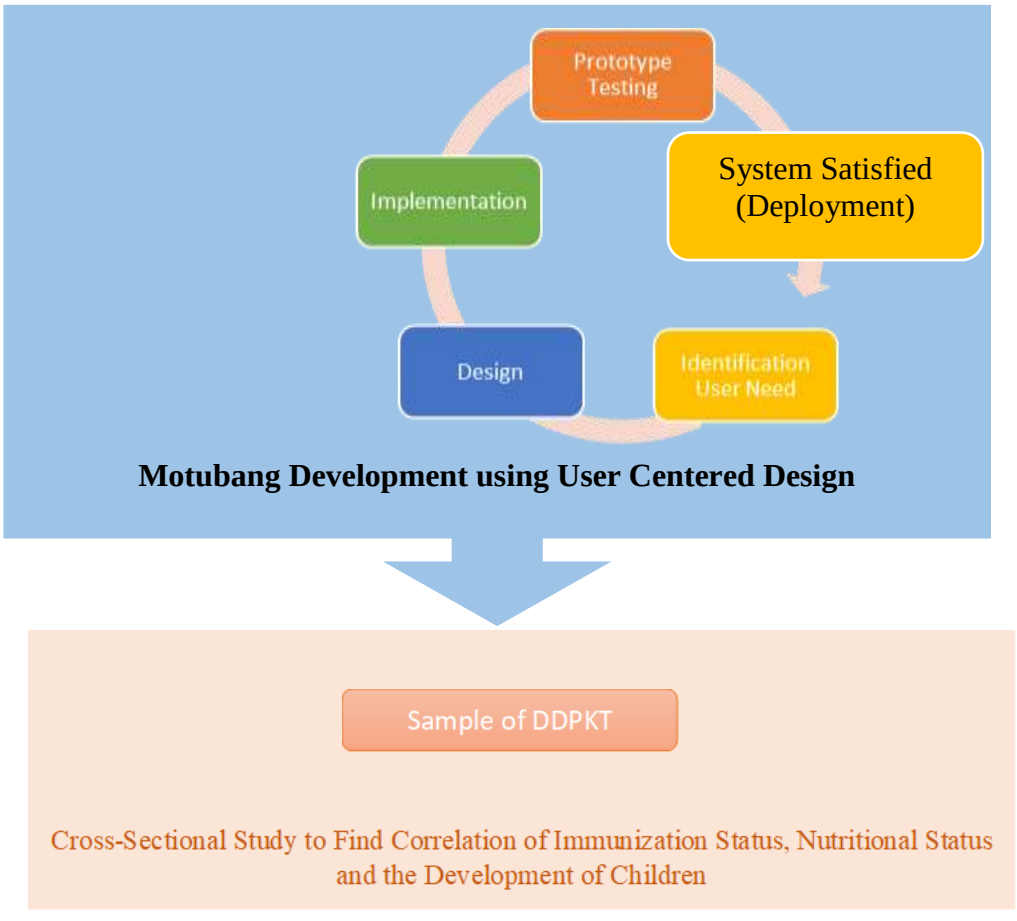


Fig 1: Research Grand Design

From the results of the identification requirements, Motubang application then designed. Motubang has several key features (can be seen on figure 2), namely:

1. Children's Data Additions Feature

In this feature parents can add data of children, and not limited to one child, parents can add the appropriate number of children under 6 years that she has.

2. Detection of Growth Feature

This feature contains the form to fill child growth factor such as, age in years, weight in kilograms, height and head circumference of children in centimeters. The application will display the results of calculation of Body Mass Index by comparing body weight with the child's height, and the growth status of the child.

3. Detection of Development Feature

This feature provides pre-screening development questionnaire or Kuisioner Pra Skrining Perkembangan (KPSP). Parents were asked to answer a questionnaire based on the circumstances of their children. If the results of the questionnaire below 80%, then the child stated experiencing developmental disorder. Tests can be performed again after a given stimulus that can be seen in the features Stimulus developments. If the stimulus has been given and the test results of the test are still below 80%, the application will give status to contact the nearest medical services.

4. Immunization Feature(Immunization Reminder)

This feature provides a reminder of immunization using "push-notification" and types of immunization that should be administered to children under the age of 6years. The immunization reminder establishing the children immunization timeline according to age that had entered on the menu "add a baby" before (using the date of birth).

5. Growth and Development Statistic Feature

In this feature parents and medical team can view statistics on height, weight, and head circumference baby in a certain period

6. Stimulus of Development and Encyclopedia Feature

This feature provides tips to stimulate the development of children as well as information / tips and tricks child care to support the growth of running optimally, as well as information about immunization.

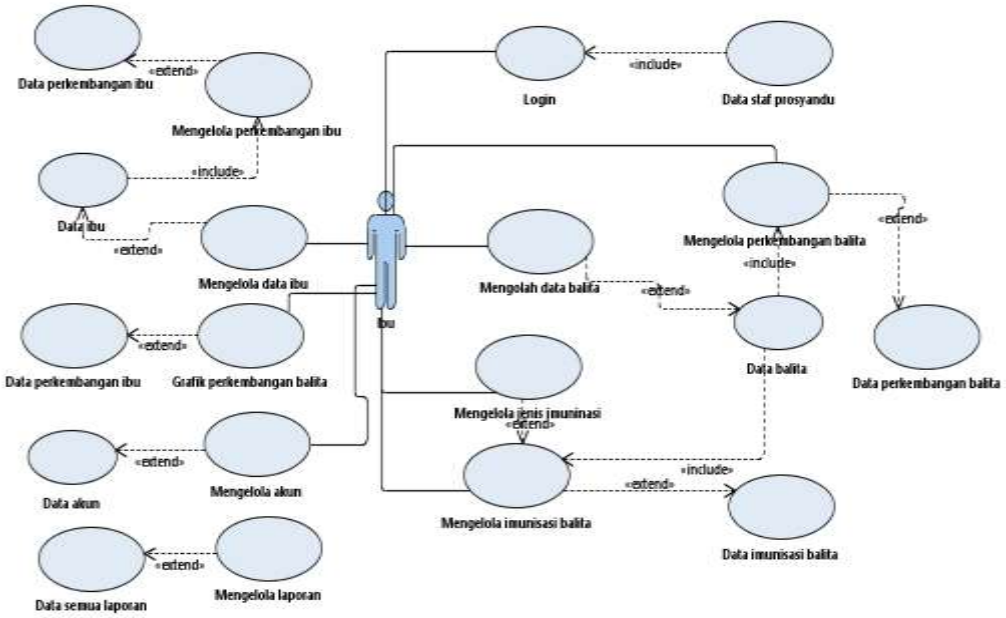


Fig 2: Use Case of Motubang Application

The results of the design then implemented in the mobile application . The implementation of Motubang done after many prototyping. The result of the implemetation can be seen in Figure 3 and 4, below.

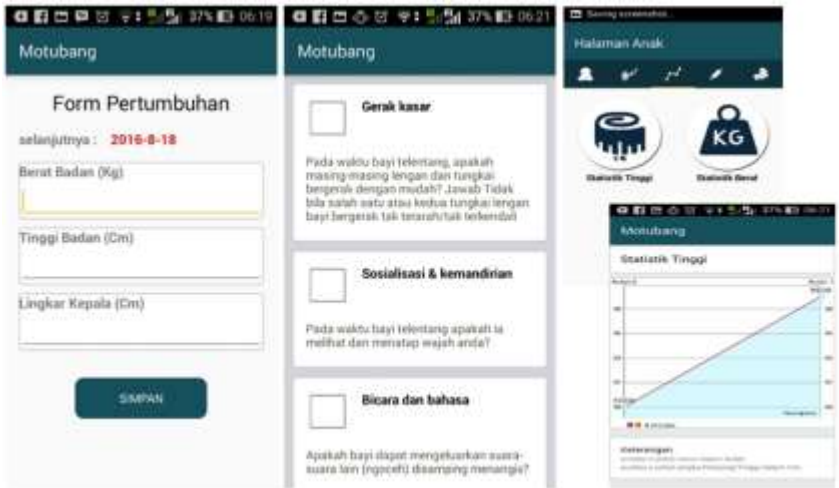


Fig 3: Detection of Growth and Detection of Development Feature

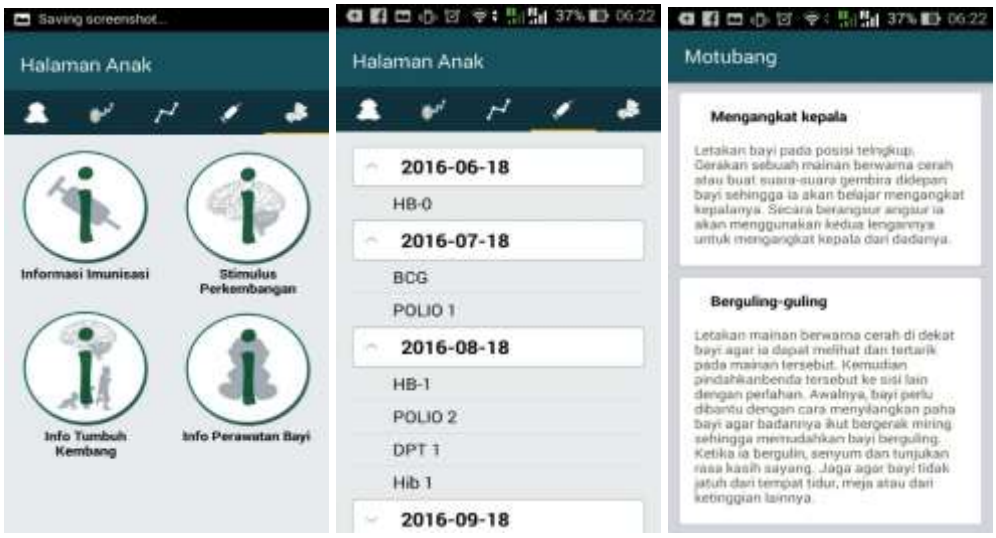


Fig 4: Immunization, Growth and Development Statistic, Stimulus of Development and Encyclopedia Feature

Motubang tested to medical teams in Puskesmas Cibiru Hilir and 15 parents using questionnaire and interview, the questionnaire results can be seen in Table 1 below.

Table 1: Motubang Testing Result

Indicator	Result
Motubang helps parent to monitor growth and development of child	73,33% respondents think that this application is very helpful. 26.66% respondents think that this application is helpful, 0% respondent think that this application not helpful at all.
Motubang helps parent to get reminded of immunization schedule	86.67% respondents think that this application is very helpful for parent to get reminded of immunization schedule. 13.33% respondents think that this application is helpful, 0% respondent think that this application not helpful at all.
Motubang helps parent to monitor nutritional status	73,33% respondents think that this application is very helpful to monitor nutritional status. 26.66% respondents think that this application is helpful, 0% respondent think that this application not helpful at all.
Motubang helps parent to get an early detection of growth and development disorder	60% respondents think that this application is very helpful for parent to get an early detection of growth and development disorder. 40% respondents think that this application is helpful, 0% respondent think that this application not helpful at all.
Motubang is user-friendly	93.33% respondent think that this application very user-friendly. 6.67% think that this application user-friendly, and 0% think that this application not user-friendly at all.
Using a similar application?	100% respondent never use a similar application.

The testing result shown that Motubang, can helps parent to monitor child growth and development. Most of parent need this application to remind them about immunization schedule and measuring growth and development variable.

Motubang will be implemented in several Puskesmas to gather data for Cross-Sectional Study to Find Correlation of Immunization Status, Nutrition Status and Development of Child (shown in figure 1 above).

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