PREGNANT WOMEN EMPOWERMENT IN MONITORING FETAL WELLBEING THROUGH FETAL MOVEMENT COUNT MOBILE APPLICATION

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A B S T R A C T

Fetal movement is one of the main indicators of fetal well-being in the womb. For this reason, every pregnant woman should be able to calculate and interpret the results of fetal movement calculations every day, so that early detection of fetal pathology can be identified by the family. Most pregnant women are not used to it and have not received information about how to calculate fetal movement. Another obstacle in calculating fetal movements is the forgetting factor. For this reason, a tool is needed to familiarize mothers with counting fetal movements every day. Existing tools still have some drawbacks. This study aims to develop an android-based application called "Kick Count", as a tool for pregnant women to count fetal movements every day. The research method uses R&D which consists of: exploring potential problems, gathering information, product design, design testing, design improvement, and product testing. The results of product trials by media experts, material experts, and groups of pregnant women state that this product is very suitable for use by pregnant women in the community. Things that still need to be perfected for the next stage are reducing memory and integrating installation instructions into the application.

INTRODUCTION

Fetal death or Intra Uterine Fetal Demise (IUFD), is one of the complications included in the Perinatal Mortality Rate (AKP). IUFD is the absence of signs of fetal life at a gestational age of more than 28 weeks or a fetus weighing >1000 grams. The incidence of IUFD is around 1% of all pregnancies. One of the efforts that can be made to reduce perinatal mortality caused by fetal hypoxia in the womb is by monitoring the well-being of the fetus in the womb. The only indicator of fetal well-being that can be done independently by the mother or her family is fetal movement. This is of course an excellent form of empowering women and families in the field of maternal and child health.

Bradford's research (2019) stated that from the survey results: 99.9% of pregnant women said that it was important for them to feel their baby's movements every day. Studies also report that pregnant women want to get more information about fetal movements, both in

writing and information obtained from health workers. However, 25-60% of pregnant women have not received any information about fetal movements. A review of several android applications that help to calculate fetal movements illustrates that these applications help to calculate the number of fetal movements, as well as other tools for calculating fetal movements. Pregnant women must press a certain button every time they feel the movement of the fetus so that the application or tool can start counting.

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Weaknesses of the previously available fetal movement counting tools include:

a. Unable to remind the mother when to count fetal movements

b. Mothers must remain concentrated on feeling the movement of the fetus for at least one hour every day. This will make it difficult for mothers who have busy activities.

c. Does not provide recommendations for actions to be taken by the mother based on the conclusions of the results of calculating fetal movements.

Calculation of fetal movements is heavily influenced by the perception and awareness of the mother so that it is subjective, so tools are needed to make it easier for mothers to remember and count fetal movements. Currently, technological developments, especially applications on smartphones, can be used to monitor fetal movements. The explanation above shows that a tool is needed that can improve the weaknesses of the tool for calculating fetal movement, so that mothers and their families become more independent and aware of the welfare of their fetus. The ultimate goal of this research is to produce a tool for calculating fetal movement that can be operated by pregnant women or their families.

METHODS

This study uses a descriptive qualitative approach, namely the method of research and development (research and development). The steps used in this study based on Borg and Gell's theory are as follows:

1. Potential and problems
2. Information gathering
3. Product design
4. Design testing
5. Design improvements
6. Product trials
7. Product revision
8. Test usage
9. Manufacture of products in bulk

At this stage of the research, only the first stage to the 6th stage will be carried out, of product trials

RESULT AND DISCUSSION

1) Potential and Problems

The first stage in research and development activities is exploring the potential and problems of deviations between what is expected and what is happening, namely pregnant women who do not routinely count fetal movements. The development of this application for counting fetal movements is very important as a form of manifestation of empowering pregnant women in assessing the welfare status of the fetus every day when the pregnant woman is not currently on a pregnancy control schedule at an authorized health worker.

In addition, it was found that the research location could reach internet signals from various wireless data service providers, and most pregnant women had Android-based cell phones. The exploration phase of these potentials and problems has been carried out in the class of pregnant women at Poskesdes, through filling out questionnaires and interviews.

Table 1. Characteristics of Respondents

Characteristics Respondents	f (%)
Age	
< 20 years	0 (0)
20-30 years	8 (50)
≥ 30 years	8 (50)
Total	16 (100)
Last education	
Elementary school	8 (30)
Junior High school	6 (56,6)
Senior High School	2 (13,3)
Total	16 (100)
Work history	
Doesn't work	14 (87,5)
Working	2 (12,5)
Total	16 (100)
Pregnancy History	
Primigravida	14 (87,5)
Multigravidas	2 (12,5)
Total	16 (100)
Habit of Counting Fetal Movement	
Yes	3 (18,8)
No	13 (81,3)
Total	16 (100)

Table 2. Knowledge and Attitudes of Respondents on Fetal Welfare Monitoring

Variable	f (%)
Knowledge	
Well	6 (37,5)
Enough	5 (31,25)
Not enough	5 (31,25)
Amount	16 (100)
Attitude	
Positive	7 (43,8%)
Negative	9 (56,2%)
Amount	16 (100)

Table 1 describes the characteristics of pregnant women that was the respondent to identify the habit of counting fetal movements during pregnancy and the need for tools to calculate fetal movements. Table 1 illustrates that the proportion of pregnant women aged 20-30 years and over 30 years is 50% respectively. More than half (56.6%) of the pregnant women who were the respondents of this study had the last junior high school education and none of them had any education up to the undergraduate level. Almost all (87.5%) pregnant women are housewives who do not earn independently, and most (75%) are undergoing a second pregnancy. Table 1 also explains that almost all pregnant women (81.3%) do not have the habit of counting their fetal movements during pregnancy.

Table 2 shows that the level of respondents' knowledge about the importance and methods of monitoring fetal well-being is divided almost evenly into the good, sufficient, and poor categories, while the attitudes of the respondents towards the importance of monitoring fetal well-being are mostly in the negative category. After obtaining information about all pregnant women in the research locations mentioned above, the next step to exploring potential problems was through Focus Group Discussions (FGD), which were attended by representatives of five pregnant women respondents.

Table 3. Results of Focus Group Discussion (FGD)

Strategic Issues	Results of FGD	Study by Researchers	Follow up Planning
Most pregnant women do not understand the importance of routinely counting fetal movements .	1) Pregnant women are of the opinion that the health and welfare of the fetus can only be known when checking their pregnancy with a health worker. 2) Pregnant women do not know that counting fetal movements is one way to find out the health of the fetus. 3) Pregnant women have never been taught or ordered by pregnancy examiners to diligently count fetal movements. 4) Pregnant women know that the fetus does not move is one of the danger signs in pregnancy 1) .	The danger signs of pregnancy that are socialized to the public generally refer to six things, including fetal movements that are not felt by pregnant women, but another important thing is a way for pregnant women to recognize that their fetus is still healthy, or vice versa that health problems have occurred in their fetus in terms of indicators. fetal movement.	Providing education to pregnant women through antenatal classes regarding the benefits and how to routinely calculate fetal movements during pregnancy, in community service activities as a follow-up to research.
Material in the class of pregnant women.	In classes for pregnant women, even before the pandemic, there had never been any material or information regarding the benefits and how to calculate fetal movement.	The material presented to classes for pregnant women generally refers to the Technical Guidelines for Classes for Pregnant Women from the Ministry of Health of the Republic of Indonesia, and it does not specifically teach how to calculate fetal movements.	Adding material benefits and how to routinely calculate fetal movement during pregnancy in pregnant women classes.
Pregnant women often forget to count fetal movements regularly.	1) Other family members never help remind the mother to count fetal movements, because they both don't know the benefits and how to do it. 2) There is no way to calculate fetal movement in the MCH book.	A tool is needed to remind the mother to count and record the results of counting fetal movements every day .	Develop tools to calculate fetal motion.

2) Information gathering

Information regarding the development of an android application for calculating fetal movement in pregnancy was obtained from various sources, including literacy studies through web searching, reviewing scientific articles on similar studies that have been conducted before, studying similar assistive devices that are already available, and discussing with experts in that field.

3) Product Design

The product developed in this study is the android application "Kick Count" which will be a tool for pregnant women in calculating fetal movements every day. The initial design of this product has been presented in chapter 3 (research method). The product development of this fetal motion counting application received reviews from two experts, namely learning technology experts with doctoral qualifications and practitioners of obstetrics and gynecology (doctor Sp.OG.). The input given by the experts is as follows:

Table 4. Opinion of the Expert Team on Product Design

No	Expert Background	Expert opinion
1.	Learning technology	a. The installation guide and step sequence are even more concise so that the installation process isn't too long and time-consuming. b. Added other media that can provide a better understanding to pregnant women the first time they install this application on their mobile phones. c. The byte size of the application is reduced so that the memory required for application installation is not too large. d. Added an alarm via cell phone to remind pregnant women to open this application.
2.	Obstetrics and gynecology specialist	a. Added a recapitulation and trend of the number of fetal movements during each week so that pregnant women know the characteristics of their fetal movements. b. Information or education displayed on the application is added to make it more useful.

4) Design Testing

Product design testing is intended to assess the effectiveness of the product produced with the aim of developing the product. This step is carried out by testing android application products to calculate fetal movement as a form of empowering the mother in assessing the welfare of her fetus. Design testing was carried out by: 1) Learning technology experts qualified as doctors of technology/learning media, who assessed the physical and operational aspects of the application, 2) Obstetrics and gynecology specialists, who assessed this application in terms of scientific content or material in the application.

Before the trial was carried out, the "Kick Count" android application product for calculating fetal movement for pregnant women had gone through a validation process in advance by the experts mentioned earlier. This expert validation aims to obtain input, criticism, and suggestions regarding this product, so that the product developed in this study can achieve the expected product development goals. The validation results by technology/learning media experts are explained in the following table:

Table 5. Media Expert Rating on Products

Aspects and Indicators	Score
The suitability of the media with the intended use	4
Installation guide	
a. Ease to understand	3
b. Sequence of steps	3
c. Time efficiency	3
Audio visual display	
a. Conformity of information with the purpose of product development	3
b. Font size suitability	3
c. Conformity of image illustration	3
d. Appropriateness of display color options	3
Application usage	3
a. convenience	3
b. Practicality	3
c. Affordability	4
Software engineering	
a. Creativity and innovation	
b. Media development opportunities for the development of science and technology	4
	4
Total Score	46
Percentage appropiateness	82%
Category	Very Worth it

Table 6. Material Expert Assessment on Products

Aspects and Indicators	Score
The suitability of the media with the intended use	4
Guide to counting fetal movements	
a. Ease to understand	3
b. Sequence of steps	3
c. Time reminder	3
Material and audio-visual display	
a. The suitability of the main material with scientific principles	4
b. Conformity of instructions for use with scientific rules	4
c. Conformity of information with the purpose of product development	3
d. The suitability of the illustration images with the material	3
e. Audio suitability for time reminder	4
Application usage	
a. convenience	3
b. Practicality	3
c. Affordability	4
Software engineering	
a. Creativity and innovation	4
b. Media development opportunities for the development of science and technology in the field of maternal and child health	4
Total Score	49
Percentage appropiateness	87.5%
Category	Very Worth it

Table 5 shows that the results of testing the product design of the "Kick Count" fetal motion counting application for pregnant women by media experts are very suitable for use by the public. The main input from media/learning technology experts is to work on reducing the bytes used for installing this application so that it doesn't require too much memory. Table 5 below presents the results of application assessments carried out by material experts (obstetrics and gynecology specialists).

Table 6 shows that the results of testing the product design of the "Kick Count" fetal motion counting application for pregnant women by material experts is very feasible for use by the community. The main input from material experts is to add recapitulation in the form of trends in the number of fetal movements felt by pregnant women every day per week and reminders every 15 minutes.

5) Design Improvements

Design improvements are made after receiving input and direction from experts according to their competence. Based on the results of the expert validation above, it can be concluded that the android application product for calculating fetal movement "Kick Count" for pregnant women that has been developed has a very suitable category for community use, especially pregnant women. This can be proven by the average score obtained from the validation by the two experts. Criticism and input were given by the expert team so that the product could be even more perfect before being tested on pregnant women.

a)   Input   of   learning technology/media experts

Reducing the size used for installing this application so it doesn't require too much memory.
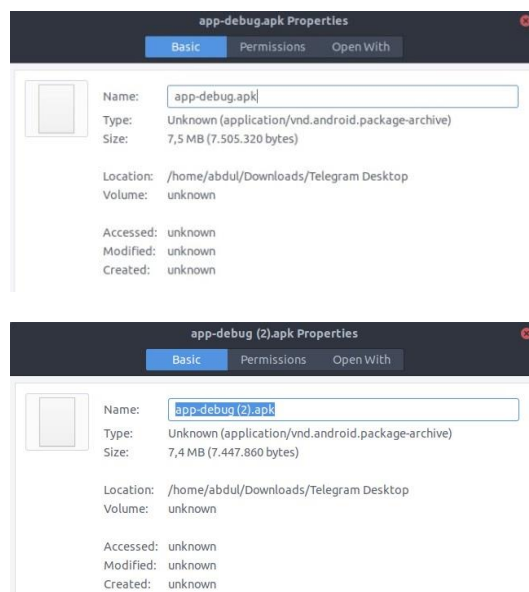
Picture 1
Application Size Reduction

b) Input obstetrics and gynecology specialists

Adding a recapitulation in the form of trends in the number of fetal movements felt by pregnant women every day per week and reminders every 15 minutes.
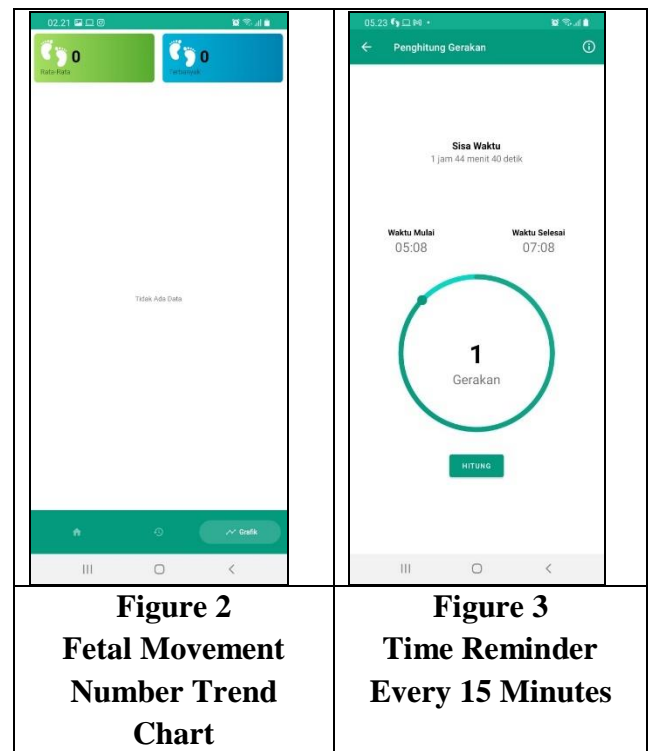

Figure 2	Figure 3
Fetal Movement Number Trend Chart	Time Reminder Every 15 Minutes

6) Product Trials

The android application product for calculating fetal movement "Kick Count" for pregnant women was tested on pregnant women respondents after making improvements or revisions based on the input and directions of the two experts, namely media experts and material/substance experts. The product trial was carried out on 16 pregnant women who attended classes on pregnant women at the Poskesdes.

Each respondent gave an assessment on the product trial assessment sheet that had been prepared by the research team to determine the

feasibility of the product for use by the wider community. The table below shows the results of the trial.

Table 7. Product Trial Results

Respondent	Total Score	(%)	Criteria
1	32	80.0	Very Worth it
2	36	90.0	Very Worth it
3	39	97.5	Very worth it
4	32	80.0	Very worth it
5	30	75.0	Worthy
6	32	80.0	Very worth it
7	30	75.0	Worthy
8	38	95.0	Very worth it
9	36	90.0	Very worth it
10	34	85.0	Very worth it
11	30	75.0	Worthy
12	35	87.5	Very worth it
13	36	90.0	Very worth it
14	33	82.5	Very worth it
15	31	77.5	Very worth it
16	36	90.0	Very worth it
Average	**33,8**	**84,4**	Very worth it

Table 6 shows that the trial in the group of pregnant women found that the android application product for calculating fetal movement "Kick Count" for pregnant women was declared very feasible by the respondents. The mean score of the feasibility of the results of this product trial is 84.4%, which is in the Very Eligible category.

The research and product development of the android application for calculating fetal movement "Kick Count" for pregnant women has gone through six of the eight steps of R&D research. In the first step of the research, a potential problem was found that most pregnant women did not have the habit of routinely counting fetal movements during pregnancy. Likewise, the level of knowledge of pregnant women on the benefits and methods of monitoring fetal well-being through fetal movement calculations. This provides a similar picture of the attitudes of pregnant women regarding counting fetal movements during pregnancy. Similar research results were also obtained by Fitri

Yani (2021), who examined the level of knowledge about monitoring fetal movements in pregnant women with pre-eclampsia.

The collection of information about the media or tools for counting fetal movements that were created before this study showed that most of these tools had the same drawbacks, namely: they did not have a reminder to start counting fetal movements, they did not have a reminder alarm feature while pregnant women were counting. fetal movement, and do not record the results of calculations of fetal movement within a certain time. The information collection carried out by this researcher was carried out through journal reviews and searches on the Play Store application.

Based on the results obtained from the previous steps, the research team developed a product design for an Android-based fetal motion counting application, which has basic features like existing similar applications, and is enhanced with features that were previously lacking in previous applications. The development of this application design also received criticism and input from media experts and material experts.

The results of product testing of the "Kick Count" fetal motion counting application conducted by media/learning technology experts and material experts state that this application is in the very feasible category for use by pregnant women in the community. Aspects and indicators that have received maximum scores from the two experts include the suitability of the media for its intended use, the suitability of the material with scientific principles of obstetrics, and software engineering that has perfected features that have not been obtained from previous similar devices.

Improvements to the product design of the fetal motion counting application were carried out after receiving input and directions in the previous step, namely in terms of . including: installation guide, use of memory, addition of a graph of the number of fetal movements, as well as additional information regarding what pregnant women should do if the results of the calculation of fetal movements experience deviations from normal.

There is input that the research team has not been able to follow up on, namely integrating the installation guide into the application, so that the installation guide is still made separately from the application and a video tutorial is added which is uploaded to the YouTube channel to make it easier for pregnant women to understand. Another obstacle in integrating this application installation guide is the impact on the additional storage space required for the installation of this application.

The final stage of this application product development research is product trials, which are carried out on pregnant women. The results of the product trial showed that the pregnant women who were respondents stated that the fetal motion counting application was very feasible to use. The responses obtained from the respondents include that this application is very helpful because:

(1) it can remind when it is time to count fetal movements every day,
(2) it can remind pregnant women every 15 minutes so that mothers can return to concentrating on counting fetal movements and avoid forgetting, remembering the time needed to calculate fetal movements once is two hours,

(3) there is information on things that pregnant women must do if the fetal movement is reduced or even does not move at all,
(4) this application is felt to be more economical because it only requires a connection with internet signal only once, namely when installing the application on an Android mobile phone,
(5) there is a recording of the calculation results for a week.

CONCLUSION

Six of the eight steps of research and product development for the android application for calculating fetal motion "Kick Count" for pregnant women have been carried out in this first phase of the study, with the following conclusions: Potential problems found at the research site include maternal knowledge regarding the benefits and how to calculate motion fetus routinely during pregnancy is still not good enough. This results in a less positive attitude towards the willingness to routinely count fetal movements. At the information gathering stage, it was found that the tools or media for calculating fetal movement that were previously available, still did not have complete features according to the needs of pregnant women.

Product design activities involve personnel who have product development competence and collaborate with research teams in building application features and designs. Application design testing has received an assessment in the "very feasible" category from media experts and material experts. Likewise with the trial phase, the Android-based application for calculating fetal movement "Kick Count" received an assessment of the pregnant women's group

after the application was refined referring to input and directions from experts/experts..

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