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ARTICLE

INNOVATION OF M-HEALTH-BASED PROSA-HI APPLICATION FOR EARLY DETECTION OF CHILD GROWTH AND DEVELOPMENT

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ABSTRACT

Digital and intelligent transformation has occurred in children's health due to technology. This study implemented the PROSA-HI app to monitor children's growth and development early on. Research uses sequential mixed approaches. This study used the User Acceptance Test (UAT) questionnaire for 291 toddler mothers to collect data through observation, interviews, and questionnaires. User acceptance testing of the PROSA-HI application indicates an average of 89.0%, indicating that user perception suggests it is suitable for implementation. Effectively monitoring children's health, growth, and development with PROSA-HI benefits parents and health staff. This technology should make it easier for parents and health providers to deliver information and services on children's growth and development without space or time constraints. The PROSA-HI app can detect growth and development abnormalities early, accurately, and precisely. The PROSA-HI app can also see the type of early stimulation given to youngsters if their growth and development are atypical for their age and update their age-appropriate data. Technology like PROSA_HI can help identify growth and development issues in youngsters. The community's comments, especially from moms with toddlers, are intended to improve their knowledge and skills in child development. PROSA-HI app.

Keywords: Application, M-Health, Early detection, Child growth, Child development

АБСТРАКТ

Цифровая и интеллектуальная трансформация произошла в детском здравоохранении благодаря технологиям. В данном исследовании было использовано приложение PROSA-HI для раннего мониторинга роста и развития детей. В исследовании использовались последовательные смешанные подходы. В данном исследовании использовался опросник User Acceptance Test (UAT) для 291 матери малышей для сбора данных посредством наблюдения, интервью и анкетирования. Тестирование пользовательской приемлемости приложения PROSA-HI показало средний результат 89,0%, что свидетельствует о том, что, по мнению пользователей, оно подходит для внедрения. Эффективный мониторинг здоровья, роста и развития детей с помощью PROSA-HI приносит пользу родителям и медицинскому персоналу. Эта технология должна облегчить родителям и медицинским работникам предоставление информации и услуг по вопросам роста и развития детей без ограничений по площади и времени. Приложение PROSA-HI может выявить отклонения в росте и развитии на ранней стадии, точно и аккуратно. Приложение PROSA-HI также может увидеть тип ранней стимуляции, предоставляемой детям, если их рост и развитие нетипичны для их возраста, и обновить данные в соответствии с возрастом. Такие технологии, как PROSA_HI, помогают выявить проблемы роста и развития у малышей. Комментарии сообщества, особенно мам с малышами, призваны улучшить их знания и навыки в области развития детей. Приложение PROSA-HI.

Ключевые слова: Приложение, m-Health, раннее выявление, рост ребенка, развитие ребенка

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INTRODUCTION

The superior energy of the Indonesian nation can be created by ensuring the fulfillment of health services, especially child health. If the child is born in good health and grows well, it will be the next generation for the development of the nation. On the other hand, children who experience delays in growth, such as stunting and wasting, will burden the family and the nation. Currently, the nutritional status of very short and short (stunting) is still high, namely 30.8%, and the 2019 National Medium Term Development Plan target's is 28% [1]. Even studies say that some countries still have significant subpopulations that face hunger and malnutrition, such as stunting and wasting [2]. It will certainly be a burden on the country.

Stunting is a form of linear growth disorder that occurs mainly in children. Wasting is a condition of a child whose weight decreases over time until his total weight is far below the standard growth curve [3]. Stunting is one of the indicators of chronic nutritional status that describes stunted growth due to long-term malnutrition [2]. Prolonged wasting can also increase the risk of stunting [(4)]. If malnutrition at the age of a toddler occurs for a long time, it can affect their physical condition and health in the future [5].

Cases of stunting must be addressed immediately because it can lead to brain development of less optimal brains, resulting in such as degenerative diseases[6–8], obesity [9,10] decreased academic achievement[6] decreases the potential of the nation's children [10] predictors of poor human quality. Children have a lower probability of 18-21% and 15-21% in mathematics and writing ability [11].

There is still data on child growth and development that must be detected according to age and cannot be used for follow-up [12]. In fact, follow-up is essential to do to be able to deal quickly and appropriately with growth and development deviations. If deviations are found, then early intervention is carried out so that the growth and development return to normal or the variations do not get heavier [13]. The child's growth and development system is still slow and inaccurate [14]; No specific and comprehensive data. There is difficulty determining the percentage of toddlers that must be detected regularly because the targets constantly change every month following the increase in the child's age [15]. No application can be used for consultations related to child health online [16].

The absence of specific data results in slow interventions and the possibility of mistargeting. The condition causes malnourished toddlers to be missed from observations, so cases will still appear in the following months. The development of technology has advanced digital and intelligent transformation, including in the health sector [17,18].

The Application of Industry 4.0 in Health Sciences facilitates the diagnosis and determination of appropriate therapies [(19)]. The use of the Internet in the current era of revolution 4.0 cannot be separated from human life. A survey by the Indonesian Internet Service Users Association (APJII) said that internet user penetration in Indonesia in 2019-2020 was 73.7%; this figure has increased by 8.9% compared to 2018. The results of the APJII survey also stated that 95.4% of internet users use smartphones/mobile phones [20]. The Internet has the potential to improve access to information and healthcare services in low-resource environments [21].

The technology of the internet has the potential to solve problems on a worldwide scale, including those that are related to the medical field. The advancement of technology has made it possible to find practical solutions to diagnostic issues, medical procedures, and access to medical information [14,22]. The only method to provide crucial follow-up care for the community is through the use of telemedicine, which is especially important in light of the COVID-19 pandemic [23,24]. Mobile health, often known as M-Health, is a new subfield of electronic health that has emerged as a result of the creative application that was developed to solve health issues. It is possible for e-health and mobile health to refer to any

electronic device or monitoring system that is applied by medical professionals in healthcare practices or by individuals in order to monitor or improve their health status [25] including monitoring the growth and development of children [26,27]. For the objective of carrying out early detection of child growth, the PROSA-HI Application is going to be implemented as part of this study. Specifically, in terms of the Security element (Application Security), PROSA-HI possesses Security Rights for database and application access, among other things that are not present in other growth and development detection programs. This is the difference between Prosa-HI, which was built, and other applications. Access through remote access methods can operate correctly through the client program, the application can function well with the anti-virus software that is currently being utilized, and there are facilities accessible for automatic backups. In the Interoperability feature of Prosa-HI, data transfer can take place between different menus.

MATERIAL AND METHODS

The quantitative research methods were utilized in the research that was conducted for this study. Either a waterfall model or a linear sequential model is utilized in the PROSA-HI development process approach. Following the completion of research, design, and coding, this approach then moves on to application testing. Application testing is performed using black box testing, which focuses on the functional requirements of the software. This type of testing is the industry standard. The performance evaluation of this information system for the development of toddlers that is based on Android was carried out by soliciting replies from potential users. As part of this user test, a quantitative descriptive method in the form of a Likert scale was utilized as the research method. The purpose of this method was to quantify the opinions or perceptions of respondents depending on the degree to which they agreed or disagreed with the statement. During this phase, testing is carried out, specifically the User Acceptance Test (also known as the UAT). In order to conduct user acceptance testing (UAT), the PROSA-HI program was made available to users, specifically 291 mothers of toddlers. If the results of the test are met with a favorable response, then the test is said to have been successful. The analysis that was performed on quantitative data was carried out by employing descriptive analysis methodologies and computing descriptive percentages based on the following categories: very viable, fairly feasible, not feasible, and not feasible.

RESULT

The purpose of the PROSA-HI mobile application system is to monitor the growth and development of children between the ages of 0 and 72 months along with identifying any deviations that may arise. This will allow for the children to be immediately followed up on if there are any deviations in their growth and development as early as possible. This mobile application can also provide information on the stimuli that parents can present to their children in order to promote the process of growth and development. This is done in order to prevent delays in growth and development. With the help of this mobile application, it is hoped that parents will be able to continuously monitor their children's growth and development whenever and wherever they are. This software is also intended to help parents refer their children to health centers, growth and development clinics, and doctors for growth and development issues. This will allow for more accurate screening to be performed. The development of this mobile application is an example of a technological solution that has the potential to simplify the process of identifying anomalies in the growth and development of children. This inquiry used black box testing to examine each system menu's forms and operations. Table 1 shows the results. Testing includes form validation and option display outcomes.

Table 1 Results of tests performed on the forms and functions of each system menu

No	Scenarios Test	Output Process	Validation
1	Login	Pages according to the user level, namely parents or health workers	Successful
2	Admin page	Home page view for the administrator's section	Successful
3	Profile Menu	User profile page view	Successful
4	Children's Menu	Where in the child list menu, there is a button : See Wipe Edit	Successful
5	Grow Menu	Displaying the history of child growth examination Interpretation of growth: BB/U (Weight/Age) PB/U (Height/Age) BB/TB (Weight/Height) Child growth chart Intervention/Action	Successful
6	Flower Menu	Displaying the history of child development Interpretation of developments: Appropriate Doubt Deviation Intervention/Action	Successful
7	Physical Menu	Physical Examination Examination Results	Successful
8	Psychology Menu	History of Psychology Psychological intervention	Successful
9	Physiotherapy Menu	History of physiotherapy Physiotherapeutic intervention	Successful
10	Material Menu	Materials related to children's growth and development	Successful
11	Nutrition Menu	History of nutrition consultation Nutritional interventions	Successful
12	Falling factor menu	Pregnancy history data Birth history data Risk factor detection data Other factors data	Successful
13	Talk Menu	Conversation data	Successful
14	Info Menu	Information about children's growth and development	Successful
15	Log out		Successful

The trial conducted in this study is a user acceptance level test that aims to determine the level of acceptance and benefits of information system applications with the desired results by users. The software testing carried out is by using user acceptance testing (UAT) using black box testing techniques to test the system against its specifications and by distributing questionnaires. System testing focuses on trying the design from the functional point of view, whether the system is functioning according to its functionality and whether the results are following what is expected. The test was carried out on mothers of toddlers totaling 291 respondents. Here are the metode Acceptance Test results from the PROSA HI system.

Table 2 Increase in the usability of the PROSA-HI application system

Variable	Frequency (n=291)	Percentage (%)
Very worthy	259	89,0
Decent enough	32	11,0
Less feasible	0	0
Not worth it	0	0

Source: Primary Data Management, 2022

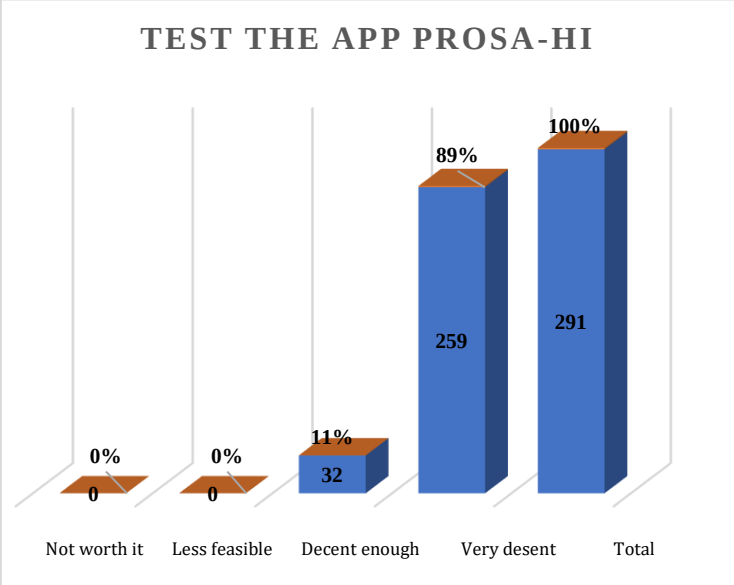

Figure 1. Test the app PROSA-HI

From the results of the PROSA-HI application trial conducted, it can be concluded that from the percentage of testing with a user *acceptance test*, which is an average of 89.0%, so it can be concluded that the usability rate of the PROSA-HI application system based on user perceptions is considered feasible to be implemented. The results of the interview also revealed that respondents stated that the PROSA-HI Application is easy to use, that the application menu is comprehensive, that the content and material are very appropriate and beneficial, that the display is beautiful, that the display layout is very reasonable, that the process of displaying information and results is very quick, that the use of language is excellent, that only a few encounter obstacles, and that the child has already fulfilled the procedure concerning the screening of growth and development.

DISCUSSION

The PROSA application_HI is a technological solution that can make detecting deviations in child growth and development more accessible. Regarding the novelty of the innovative products produced, Prosa-HI uses application security and interperability technology, until now there has been no early detection application for child growth and development that can see track records of previous examinations. Prosa-HI is packed with simpler features but still pays attention to needs so it is easy to operate. Another advantage that you should know about Prosa-HI is that Prosa-HI is an application program developed for comprehensive early detection of children's growth and development. Prosa-

HI is a multiuser application or an application that can be accessed by several people at the same time so that it can be used in any area and anywhere. Growth and growth disorders at the beginning of life have become central themes in child health [28]. The results of the tests that have been carried out show that the Application built already meets the functional requirements and is feasible to implement.

Public interest in mHealth has increased [29]. The PROSA-HI Application has the advantage of updating child growth and development data that must be detected according to age. The PROSA-HI Application provide accurate and comprehensive information. Several journals that discuss child growth and development that documentation can be done quickly with mobile applications [30–32].

In addition to being able to present a menu of children's data. The Application can display graphic images for growth and development by filling in the DDTK instrument. Therefore, an android-based Application using the KPSP instrument to calculate the number of answers from application users regarding child growth and development will be more accessible [33]. KPSP uses four child development indicators: gross motor, fine motor, speech/language, and socialization/independence. This is in line with one empirical study using four applications to test child development for cognition, tongue or motor cognition [34,35].

The PROSA-HI Application can also look at the type of early stimulation given to children if the child's development is declared abnormal according to his age, as well as being able to update child growth and development data that must be detected according to age. So, parents and health workers have greatly helped nearly seeing child growth and development [25,36]. In line with the use of FICare technology with more interactive features that can allow greater parental participation [37].

The PROSA-HI Application can provide early, accurate and accurate information on cases of growth and development disorders that can be known before. According to Doll and Torkzadeh, Ease of Use measures user satisfaction or user-friendliness in systems such as entering, processing, and finding the information needed. Timeliness measures user satisfaction in terms of system timeliness in presenting or providing data and knowledge required by users. A timely system can be real-time [12,38–40].

Most respondents said that in terms of appearance, it is beautiful, easy to use, and punctuality very appropriate. In line with what Doll and Torkzadeh stated that user satisfaction in terms of the appearance and aesthetics of the interface is very reasonable, the appearance of the system makes it easier for users when using the system so that it can indirectly affect the level of effectiveness of the user [(41)]. In addition to providing a user-friendly interface; the underlying software has been extensively tested by research groups working on child growth data [15]. Other studies have shown that it allows app users to consult from home [42].

Most respondents stated that they were complete in terms of content or material. The Application's content can provide information to application users, such as materials and videos related to child growth. From supporters of digital integration of children, the video children can also immediately see the learning for the child. Exposing children to technology at an early age is beneficial for developing their academic and technological curiosity [43]. Users' satisfaction level will be even higher if the system provides information informatively and altogether [44]. There was a significant increase from the total pretest score to the total post-test score ($p < 0.001$). Educational videos based on smartphone applications are an effective and trusted child health promotion medium for Puskesmas officers and parents. Other studies [32] have also revealed health education through web applications is more effective, with statistical scores of 60 for pretest scores and 80 for postes scores ($p=0.000$), while educational scores that are simply by reading books from the control group, show the same score for pre-and post-test scores, 70

(p=0.960. Other studies have also stated that the home video erodes AIMS is feasible for parents of developing children [45].

CONCLUSION

The PROSA-HI Application can effectively monitor children's health, growth, and development, positively impacting parents and health workers. This technology is expected to facilitate parents and health workers to provide information and services without being limited to space and time. Advice is given to midwives and other health workers to give more knowledge to mothers with children under five about early detection of growth and development using the PROSA-HI Application. For the community, especially mothers who have toddlers, it is hoped that they can add insight and knowledge and improve their skills related to child growth and development.

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DECLARATIONS

Ethics Approval: This study was approved by the Institutional Review Board in Universitas Jenderal Achmagghyud Yani Yogyakarta (SKep/384/KEPK/XII/2022).

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