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USING ADDIE MODEL TO DESIGN EARLY DETECTION SYSTEM OF CHILD GROWTH AND DEVELOPMENT IN THE COMMUNITY HEALTH CENTER OF BENDOSARI, SEMARANG INDONESIA

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ABSTRACT
To reduce the increase of the impaired child growth and development, early detection system is needed. The system designed based on information technology will facilitate the health personnel to achieve the desired outcome. In this study, the early detection system was developed using ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instruction model. The evaluation showed that the early detection system was effective in terms of completeness (7.2), ease (13.60), timeliness (7.60), accuracy (17.10), and conformity (8.00). This innovation is expected to contribute positively for child growth and development in Indonesia

Keywords: early detection system, ADDIE, child and growth development

INTRODUCTION

The World Health Organization (WHO) reported that 5- 25% of preschool aged children suffer from minor brain dysfunction, including mild motor development disruption.[1] While the Indonesian Ministry of Health reported that 0.4 million (16%) of under-five children have developmental disruption, both fine and gross motor development, hearing impairment, lack of intelligence, and speech delay.[2] If these are not detected earlier, the impairment of growth and development of children will be continually increased.[3] Thus, early detection for children is needed as a process of monitoring child development.

Early detection is a part of health program that affects nearly 80% of maternal and child health through primary health care. However, the system may not

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be good enough to implement early detection on the field.

The preliminary results in the Health Center of Bendosari through interviews with local health personnel indicated that the existing system cannot categorize the target data that must be detected according to age. In addition, it also cannot provide early information quickly, precisely, and accurately. The system used by midwives today is manually using a paper format, which lead to the slow process. Therefore, the evolution from the use paper to computerized based system is needed; an innovation in the form of a computerized system to facilitate quick data processing, analyzing, and reporting of activities. The use of the information technology is considered able to improve the quality of health services. Thus, the purpose of this study aimed to produce the innovation for early detection of child growth and development using Instructional systems design (ISD), ADDIE model.

INSTRUCTIONAL SYSTEMS DEVELOPMENT (ISD)

The ISD process involves five steps: analysis, development, design, implementation, and evaluation (ADDIE). The concept of ISD has been around since the early 1950s, ADDIE first appeared in 1975. It was created by the Center for Educational Technology at Florida State University for the U.S. Army and then quickly adapted by all the U.S. Armed Forces.[4-6] The military, having a large number of instructional designers, greatly influenced much of the corporate world to adapting the ISD or ADDIE model.

DEVELOPING INFORMATION SYSTEM FOR EARLY DETECTION OF CHILD GROWTH AND DEVELOPMENT

This was a Research and Development (R&D) study following the instructional system design with analysis-design-development-implementation-evaluation (ADDIE) model to develop early detection system of children growth and development.

Analysis

This step is to analyze characteristics of the systems, the needs and limitations of the system, and formulate health workers need.[7] In this study, the analysis has already implemented by in-depth interview with the health personnel in the Community Health Center of Bendosari, which its result indicated that there was a slow process of early detection of children by paper format manually. They all agreed that they need innovation using computer system.

Design

Where an outline and description of the system and storyboard are created. Module, software program, instrument to assess the quality of system modules are designed and determined.[7] In this study, the development of early detection program (Indonesian version) was the result of the analysis step, which aimed to help and facilitate the health personnel as the implementer of the program. The system was developed using local web server (PHP), which this program could be operated directly on the computer. The component of the systems consisted of Input, Process, and Output: (see Figure 1)

a) Component of input includes data of growth and development of under five children. It includes demographic data consisting of name, parent's name, gender, and birth date; data of child growth including birth weight, current weight, height, and infant's age; and data of development including data on the results of child development in accordance with the age of the child.

b) Component of process includes the processing from the input component to the form of information and graphics.
c) The output component includes the child service report, such as the growth and development report of the child; growth indicator such as nutritional status, and growth chart as well as developmental indicator such as check-up result of developmental disorder and emotional mental disorder.

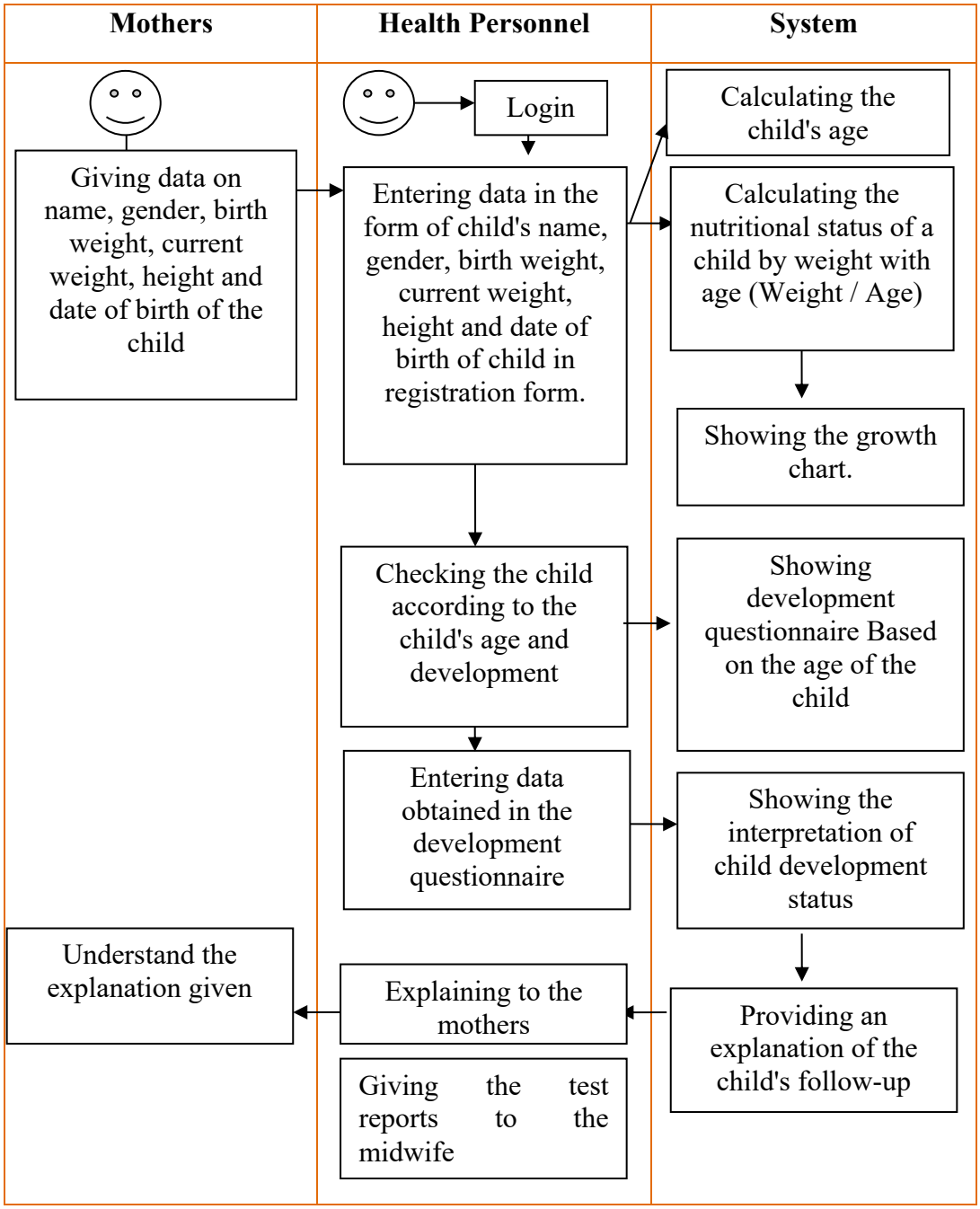


Figure 1 The Service System Flow of Early Detection for Child Growth and Development

Development

In the development phase, instructional designers and developers create and assemble content assets blueprinted in the design phase. In this phase, the designers create storyboards and graphics. In this study, the early detection system has been developed for two weeks. The early detection system design interface was described in the pictures below:

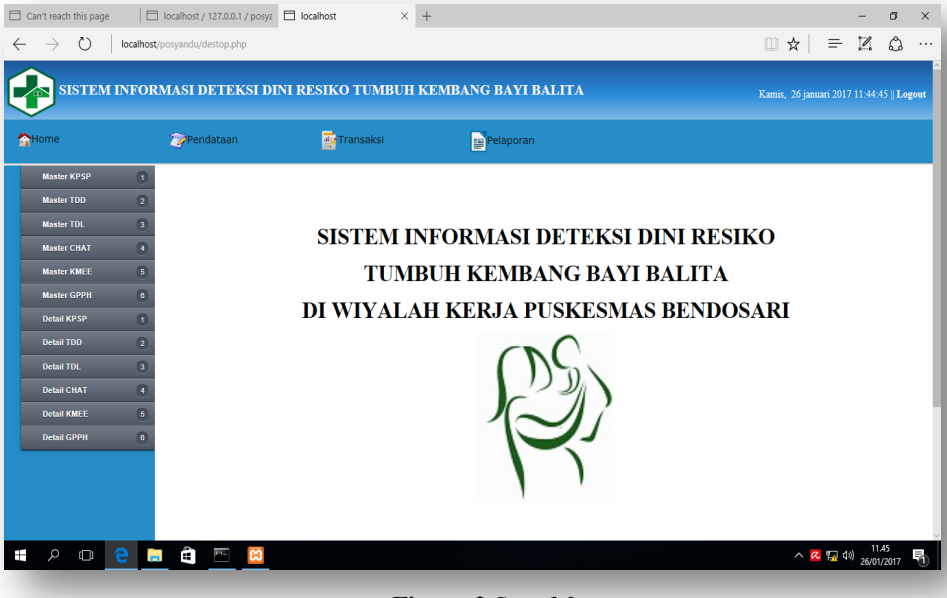


Figure 2 Start Menu

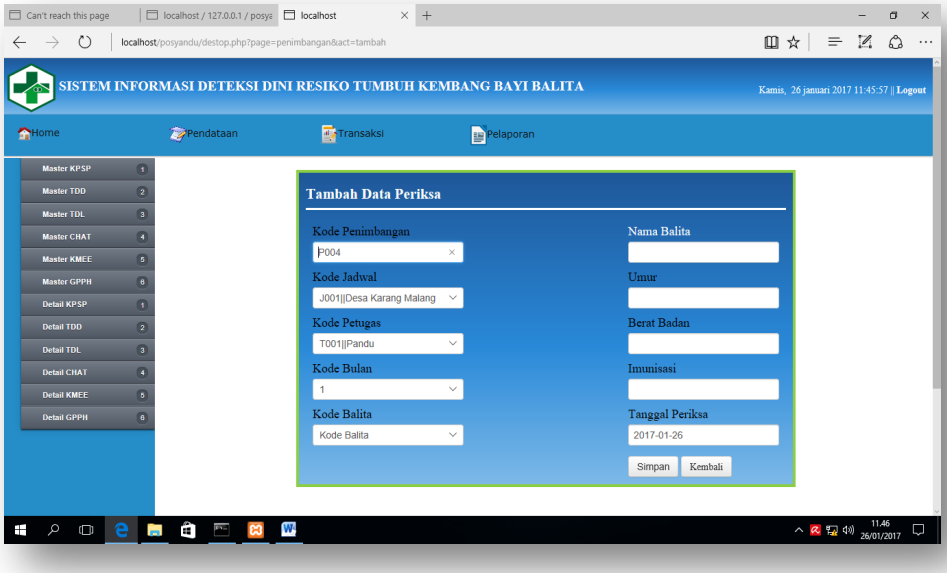


Figure 3 Child Data Menu

Figure 3 is the screenshot of menu “Child data” to enter the infant's identity on the first examination coming to the Health Center. The menu includes a toddler's name, date of birth, gender, age, height, birth weight, parent's name, and address

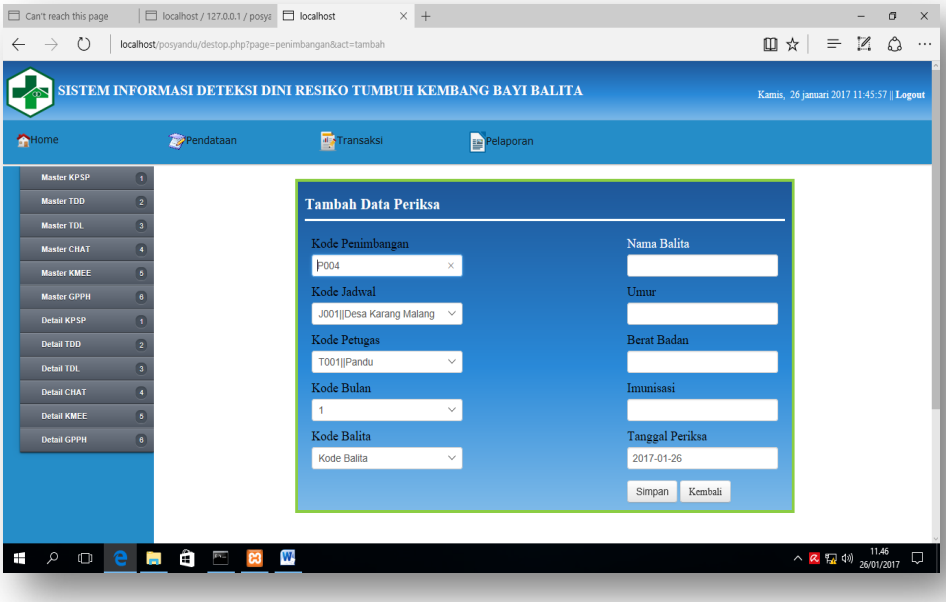


Figure 4 Child Check-up Data

Figure 4 shows the child examination data menu to enter the child check-up data on the next visit. The contents of the check-up menu include the name of the child and the age that appears automatically when clicking on the code of the children, the weight field, the immunization given, and the previous date of check-up.

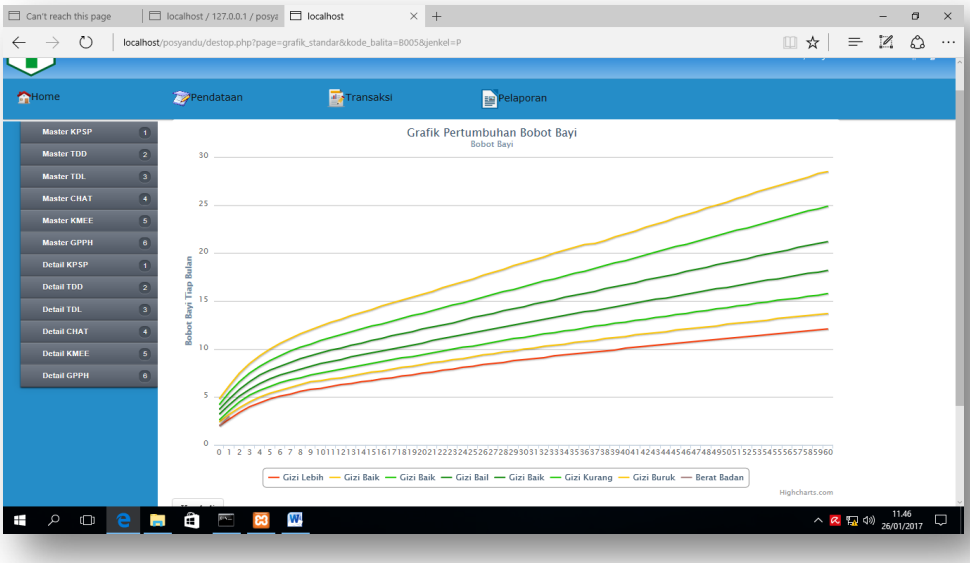


Figure 5 Screenshot of Competency Standard

Figure 5 views the growth chart that will bring the value automatically from child weight compared with their age. On the growth chart will emerge an interpretation of the nutritional status whether the child is malnutrition, normal, or obese.

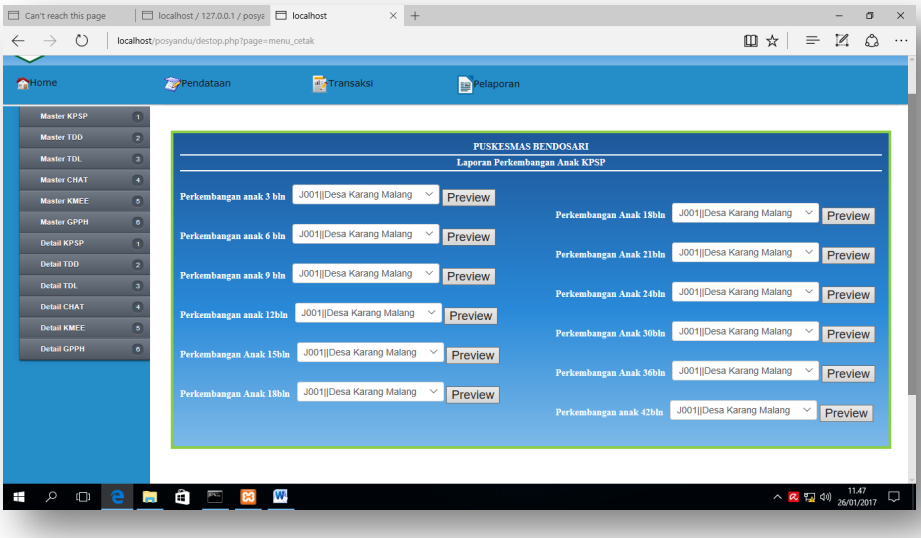
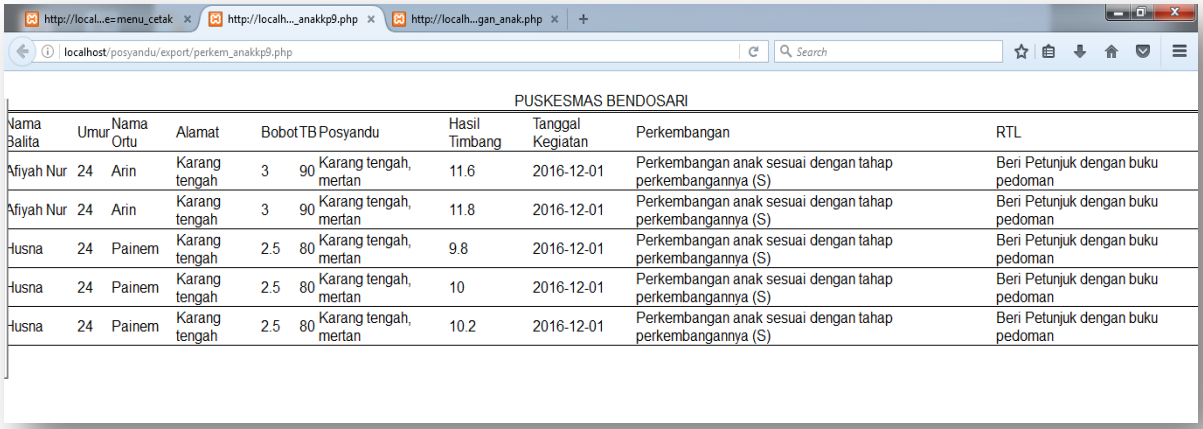


Figure 6 Child Development Report

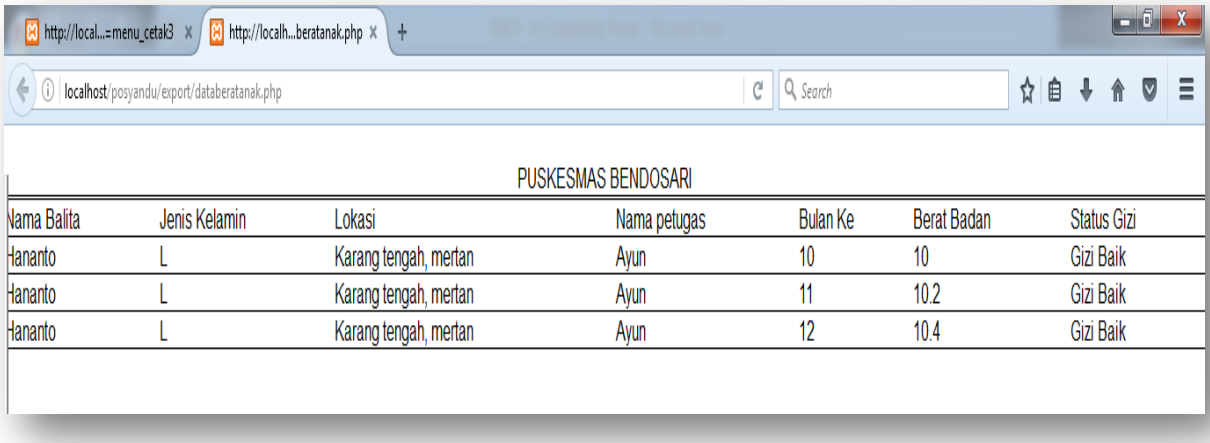


PUSKESMAS BENDOSARI

Nama Balita	Umur	Nama Ortu	Alamat	Bobot	TB	Posyandu	Hasil Timbang	Tanggal Kegiatan	Perkembangan	RTL
Afiyah Nur	24	Arin	Karang tengah	3	90	Karang tengah, mertan	11.6	2016-12-01	Perkembangan anak sesuai dengan tahap perkembangannya (S)	Beri Petunjuk dengan buku pedoman
Afiyah Nur	24	Arin	Karang tengah	3	90	Karang tengah, mertan	11.8	2016-12-01	Perkembangan anak sesuai dengan tahap perkembangannya (S)	Beri Petunjuk dengan buku pedoman
Husna	24	Painem	Karang tengah	2.5	80	Karang tengah, mertan	9.8	2016-12-01	Perkembangan anak sesuai dengan tahap perkembangannya (S)	Beri Petunjuk dengan buku pedoman
Husna	24	Painem	Karang tengah	2.5	80	Karang tengah, mertan	10	2016-12-01	Perkembangan anak sesuai dengan tahap perkembangannya (S)	Beri Petunjuk dengan buku pedoman
Husna	24	Painem	Karang tengah	2.5	80	Karang tengah, mertan	10.2	2016-12-01	Perkembangan anak sesuai dengan tahap perkembangannya (S)	Beri Petunjuk dengan buku pedoman

Figure 7 Child Development Report

Figure 6 and 7 show the child development reports presented per age of infant and toddler. In each choice of developmental reports according to the age of children will present a report of the identity of the children as well as their weight and nutritional status.



PUSKESMAS BENDOSARI

Nama Balita	Jenis Kelamin	Lokasi	Nama petugas	Bulan Ke	Berat Badan	Status Gizi
Hananto	L	Karang tengah, mertan	Ayun	10	10	Gizi Baik
Hananto	L	Karang tengah, mertan	Ayun	11	10.2	Gizi Baik
Hananto	L	Karang tengah, mertan	Ayun	12	10.4	Gizi Baik

Figure 8 Child Growth Report

Figure 8 views the child growth report presented in each month. In the choice of report, each child will emerge the identity of children well as the results of weighing and nutritional status.

Implementation

The implementation phase includes the testing of prototypes and training to respondents.[7] In this study, the software had been tried out to 10 respondents (5 midwives and 5 health personnel or cadres) selected using purposive sampling. This has been implemented one time on December 2016.

Evaluation

The early detection system was evaluated by the respondents using the questionnaire that has been developed in the development step. The 5-likert scale was used, consisting of strongly agree (5), agree (4), simply agree (3) disagree (2), and strongly disagree (1). The 5 items were evaluated, including completeness, ease, timeliness, accuracy, and conformity. The evaluation was measured before and after the training of the system. Before training means that the respondents were invited to use the system without the training from the researcher; and after training means that the respondents were asked to test the system again after trained how to use the system. Wilcoxon test was used to analyze the data.

Table 1 Evaluation of the Early Detection System

Evaluation Aspect	Before Training	After Training	p-value
Completeness			
Mean ±SD	4.80±0.919	7.2±1.033	0.007
Min-max	4-6	6-8	
Ease			
Mean ±SD	10.50±1.354	13.60±1.174	0.007
Min-max	8-12	12-15	
Timeliness			
Mean ±SD	5.60±0.843	7.60±0.843	0.008
Min-max	4-6	6-8	
Accuracy			
Mean ±SD	13.90±1.287	17.10±2.132	0.008
Min-max	11-15	15-20	
Conformity			
Mean ±SD	5.80±0.422	8.00±0.000	0.003
Min-max	5-6	8-8	

*)<0.05, Significant Level

Table 1 shows that there was a statistically significant difference of using the early detection system after the training in terms of completeness (7.2), ease (13.60), timeliness (7.60), accuracy (17.10), and conformity (8.00) with p-value <0.05. It was proved that the early detection system is effective to monitor the child growth and development. The function of this information system is to reduce the error rate, reduce the time to fix errors, speed up the timing of the provision of reports, improve system security, and increase satisfaction. [8] If the information presented is qualified, then the decision making will not be misled.[8]

Limitation of the study

The results of this study might not be generalized due to lack of respondents. Further study is needed with bigger sample size to examine the completeness, ease, timeliness, accuracy, and conformity of the system.

CONCLUSION

It can be concluded that the early detection system was effective to be applied in

monitoring the growth and development of the children. This innovation is expected to contribute positively to reduce the child developmental disorder in Indonesia.

Declaration of Conflicting Interest

None declared.

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Authorship Contribution

Authors equally contributed in this study.

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