FOOD
RESEARCH

Acceptability of the "PSG Balita" application on the android platform to enhance the quality of information regarding the nutritional status of toddler

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Abstract

The study aimed to assess the use of the "PSG Balita" application on the Android platform to enhance the quality of information regarding the nutritional status of toddler. A quasi-experiment design study was conducted with digital and manual interventions in two districts/cities involving 40 nutritionists at the Health Center. The training used an android application called "PSG Balita," and a manual book from the Indonesian Ministry of Health (PMK No. 2 of 2020 concerning Child Anthropometry Standards). Training on the use of the application was conducted over 16 hours of meetings. Data collection on information quality, including four aspects (timeliness, completeness, accuracy and usefulness), was conducted by trained enumerators through interviews and observations using a structured questionnaire. Using the R-Cmdr program, the analysis of the quality of the information is repeated, measured and kept separate from the T-Test. The intervention results of each group showed an increase in the quality of nutritional status information ($p<0.05$). The intervention group using the Android platform "PSG Balita" application showed better improvement ($p<0.05$) compared to manual intervention. In addition, digital-based recording and reporting models can produce more information output and are helpful in nutrition program planning, monitoring and evaluation. Digital systems (PSG Balita) are better than manual ones, and data analysis results are more useful for planning, monitoring, evaluating nutrition programs and making decisions.

1. Introduction

The post-2015 development agenda objectives and development in 2030, was targeted to achieve the absence of nutritional problems, both macro and micro nutrition, also meeting the achievement of international targets by 2025 in reducing stunting and wasting problems in every toddler as well as adolescent nutrition, nutrition for pregnant and lactating mothers, and the nutritional problem of the elderly (Howden-Chapman *et al.*, 2017). Nutritionally, there is a large disparity between regions or provinces in Indonesia (Al Rahmad *et al.*, 2020b) and WHO has identified areas that has moderate (20-30%) and severe (>30%) nutritional problems (Nadiyah *et al.*, 2014).

In monitoring the nutritional status of toddlers, a model is needed to measure and assess the nutritional status of toddlers sourced from WHO reference standards (Al Rahmad *et al.*, 2020a). Therefore, in measuring the magnitude of nutritional cases in the community, it is necessary to use nutritional status

parameters (MoH Indonesia, 2020). Decision-making, data development, and health workers need access to regional health information systems (Mardani *et al.*, 2019). According to Ganeshkumar *et al.* (2011), the indicator of the success of a program stem from precise recording and good reporting. Regardless of the model of nutrition activities/programs, the benefits will be less significant. Meidani *et al.* (2022) support this viewpoint. It turns out that accurate, up-to-date, and complete information can help improve the way healthcare services are given, although, in reality, it is rarely found, both related to data and the existence of information on public health services.

Low-quality resources are an inhibiting factor for the success of monitoring the growth of children under five years old (Rana *et al.*, 2021). Efforts to improve performance and work are achieved by a recording model for reporting and an information model from the results of monitoring nutritional status (Salam *et al.*, 2019). It is essential to develop a model for providing the

information referred to as digital so that more complete, faster, and better data and information will be obtained (Ventola, 2014). Data processing through digital tools such as androids or computerization is essential to produce quality information and data (Christesen *et al.*, 2016), as a solution to improve the accuracy of recording and providing information on the nutritional status of toddlers, the use of WHO 2005 as a reference is highly recommended in processing nutrition survey and monitoring data (Scherdel *et al.*, 2016).

Previous research has shown that the "PSG Balita" prototype model designed using the Waterfall method on the Android platform can be accepted for use to calculate the nutritional status of toddlers (Al Rahmad and Junaidi, 2020) and also shows better effectiveness in calculating nutritional status on the WHZ, WAZ, HAZ, and BAZ parameters (Al Rahmad *et al.*, 2022). The application was designed using the WHO-2005 standard reference. According to de Onis (2017), the WHO standard is better for predicting nutritional problems than the CDC-2000. Several research results confirm that the WHO-2005 standard is very well used in determining nutritional statuses, such as the study by Silveira *et al.* (2011) that the use of graphs from the WHO-2005 reference standard is better in screening children's nutritional status because it allows for detecting a higher number of malnourished children or nutritional risks than graphs from the CDC and NCHS. According to Ziegler and Nelson (2012), the WHO-2005 growth standard was carried out on healthy children who received exclusive breastfeeding and lived in a healthy environment, with more frequent measurements (weekly, monthly for infants 0-24 months), so it was very good at monitoring growth in infancy (under six months). While the CDC standards for exclusively breastfed children are very few, the CDC curve is not good at explaining the rate of weight gain at the beginning of the growth of children aged 0-6 months.

Therefore, it is essential to make nutritionists who work in health centers able to conduct digital-based nutritional status assessments, and it is necessary to provide application-based education and training as a means of increasing good resources and having quality and quantity values in operating the "PSG Balita" application on the Android platform. Hopefully, nutritionists at health centers can create quality data information in the analysis and reporting process. The purpose of this study was to compare the quality improvement of under-five nutritional status data between those who received training in the "PSG Balita" application on the Android platform and manual nutrition workers in Aceh Province.

2. Materials and methods

This quantitative research is a Quasi-Experimental design. The research design was carried out using a non-equivalent group pretest and posttest, with the research subjects coming from two sample groups that were taken without a random process. This research was conducted in several health centers in Banda Aceh (intervention) and Aceh Besar (comparison), with the implementation time starting from August to October 2022. This study has obtained ethical approval from the Health Research Ethics Commission (HREC) of the Health Polytechnic of Aceh, Ministry of Health. Ethical approval registration number LB.02.03/014/2021.

Subject inclusion criteria are nutritionists with a minimum education of Associate's Degree in nutrition, who can operate Android smartphones and computers, and acting as nutrition program managers. The population in this study were all nutritionists, following the sample inclusion requirements. Calculation of the sample size used the equation Hypothesis testing for two population means (Flikkema and Toledo-Pereyra, 2012), through software (Sample Size ver. 2.0). The number of volunteers in this study was 40 nutritionists, divided into 20 for the intervention group and 20 for the randomly chosen control group after adjustments between groups and the dropout factor.

Research variables include independent variables such as intervention through training and implementation of WHO-2005 growth standards using the "PSG Balita" application on the Android platform and using manual standards (Regulation of the Minister of Health of Indonesia, No. 2 of 2020 concerning Child Anthropometry Standards) (MoH Indonesia, 2020). At the same time, the dependent variable is the quality of information on the nutritional status of toddlers, including accuracy, completeness, accuracy and benefits. The data in this study consisted of primary data and secondary data. Primary data includes nutritionist characteristics data and nutritional information quality data. Characteristic data collection was obtained through interviews using a questionnaire with nutritionists carried out at the time of registration.

Training in the treatment group with the application of the "PSG Balita" application on the Android platform (Al Rahmad and Junaidi, 2020) and in the control group using a Regulation of the Minister of Health of Indonesia, No. 2 of 2020 concerning Child Anthropometry Standards (MoH Indonesia, 2020). For data on the quality of nutritional status, information was obtained through interviews using questionnaires (System usability scale and Mobile application rating scale) and checklists during observations with

measurements referring to the equivalence of answers obtained during the assessment, that is after the training and one month after the training compared to before the training (Lewis, 2018; Terhorst *et al.*, 2020) Aspects of the quality of information include the timely collection of nutritional reports, the completeness of filling out anthropometric data and nutritional status data, the accuracy of analyzing the nutritional status of a toddler, and the usefulness data used in decision-making.

Data processing for the information quality variable is done by calculating the percentage based on checklist items in each aspect (timeliness, completeness, accuracy and usefulness), with the lowest percentage score of 0.0% and the highest 100.0%. Then in analyzing the data with the R-Cmdr statistic. Pre-requisite checking is essential for parametric statistics because the distribution and variance between data sets must be symmetrical. The tests used for this check include the Kolmogorov-Smirnov and Levene's Test for Equality of Variances. Data analysis using Repeated Measured Anova and Independent Samples t Test. The Repeated Measured Anova statistic was used to measure the effect of training and implementation of WHO growth standards. Meanwhile, the Independent T-Test statistical analysis was used at 95% CI to compare the effectiveness of training using a manual application.

3. Results and discussion

The research was carried out in health centers in Aceh Besar and Banda Aceh city districts. Based on Table 1, the characteristics which include variables such as age, gender, education, and participation in training, with almost the same proportion between the treatment group (receiving training and implementing application-based WHO growth standards using the "PSG Balita" application on the Android platform) and the control group (provided with training and applying standards).

Statistically, it can be proven that the age distribution of the research subjects between those from the treatment group and the control group did not show a significant difference (p = 0.327), as well as the distribution of sex (p = 0.633), the distribution of education (p = 0.528) and the distribution of nutrition training (p = 0.256). There was no difference (p>0.05), indicating that the research subject group based on the treatment group and the control group came from the similarity of characteristics with the expectation that there was no data discrepancy in the results of this study.

The "PSG Balita" application was developed based on the Android platform with the Waterfall model method. The z-score calculation in the application used the LMS equation, and the standard being used is the WHO-2005 standard (WHO Multicentre Growth Reference Study Group, 2006), namely:

$$Z_{ind} = \frac{\left[\frac{y}{M(t)}\right]^{L(t)} - 1}{S(t).L(t)}$$

This application has gone through several revisions from 2019 to 2022. Currently, the PSG Balita application can be accessed freely in Playstore. The results of z-score calculations on four indices show the same valid values as the WHO Anthro application (PC version). The application still uses the Indonesian language, and there are two main features in this application, namely Anthropometric Calculator and Individual Assessment, as shown in Figure 1 and Figure 2.

Statistically, the effect of training and implementation of WHO growth standards between those who use the application and conventional/manual training on changes in Table 2 provides the level of detail on the nutritional status of toddlers. The study's results prove that after one month of intervention and implementation, participants who use the "PSG Balita" application show that the quality has increased. Various

Table 1. Characteristics of the treatment group

Sample characteristics	Treatment group		p-value*
	Intervention (%)	Control (%)	
Age			
26 – 35 years old	9 (45.0)	6 (30.0)	0.327
36 – 55 years old	11 (55.0)	14 (70.0)	
Sex			
Male	2 (10.0)	3 (15.0)	0.633
Female	18 (90.0)	17 (85.0)	
Education			
Associate's degree in nutrition	7 (35.0)	9 (45.0)	0.528
Bachelor's degree in nutrition or public health	10 (50.0)	9 (45.0)	
Post-graduate in nutrition or public health	3 (15.0)	1 (10.0)	
Nutrition training			
Yes	17 (85.0)	14 (70.0)	0.256
No	3 (15.0)	6 (30.0)	
Total	20 (100.0)	20 (100.0)	

Table 2. The effect of interventions on the implementation of using the "PSG Balita" application and manuals on the quality and information of the nutritional status.

Quality and information on the nutritional status	Training and implementation of standards WHO growth			
	Pretest – Post-test 1		Post-test 1 – Post-test 2	
	ΔMean±SD	Sig.	ΔMean±SD	Sig.
Timeliness (%)				
Intervention group	3.2±6.645	0.078*	17.8±7.103	0.000
Control group	2.6±3.175	0.063*	11.5±6.759	0.001
Completeness (%)				
Intervention group	10.1±4.908	0.001	22.4±5.202	0.000
Control group	3.4±6.749	0.085*	1.9±4.631	0.079*
Accuracy (%)				
Intervention group	11.2±6.876	0.001	8.4±5.404	0.001
Control group	1.6±4.493	0.039	5.2±6.041	0.012
Usefulness (%)				
Intervention group	3.5±3.102	0.004	7.1±5.821	0.000
Control group	1.9±3.251	0.135*	1.4±5.405	0.086*

Δ: Mean difference, SD: Standard deviation, *Not significant at 95%.
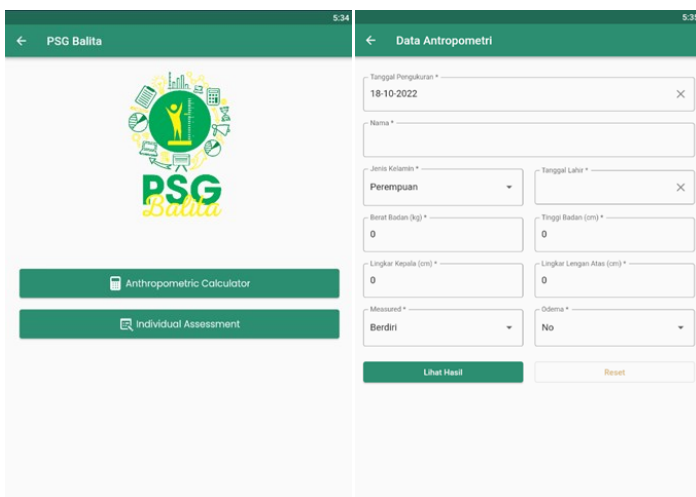

Figure 1. Main menu and anthropometric data on the PSG Balita application.
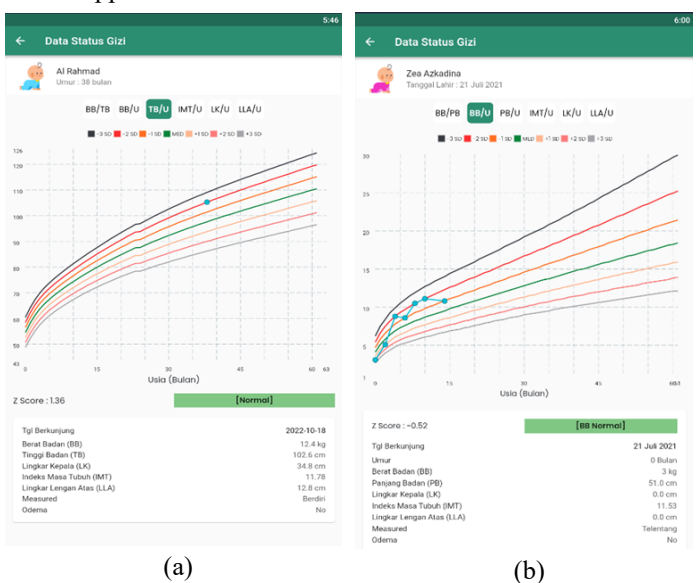

(a)   (b)

Figure 2. Results of nutritional status data analysis using the Anthropometric Calculator (a) and Individual Assesment (b) on the PSG Balita application.

aspects of the quality of information from data on the nutritional status of toddlers (in terms of timeliness, completeness, accuracy and benefits) after intervention for one month showed a significant effect (p-value <0.05) in the Banda Aceh City Health Office. Meanwhile, in the control/comparison group that used the Minister of Health Decree, the results of the training had no effect on improving the data and information on the nutritional status of children under five. The data test results have proven that the quality of information only has an average difference. Only aspects of timeliness and accuracy showed significant changes (p-value <0.05), on the other hand, aspects of usefulness and aspects of completeness did not show that the quality of data and information differed between times, namely one month after the implementation of WHO growth standards, (p-value >0.05).

Improving the quality of information on the nutritional status of children under five is very significant for nutritionists, indicating that the use of WHO growth standards is essential in assessing and monitoring the nutritional status of children under five and can also improve the process of reporting nutritional data from the health center level to the health department level. Strengthened by management support at each public health center, it is possible to help nutrition workers to improve the quality of data and nutrition information. Sligo *et al*. (2017) stated that organization is a factor and human resources as the basis for implementing a good capacity and capacity building program can support the achievement of health services according to coverage and support the use of appropriate health infrastructure. According to experts, information technology is expected to improve the effectiveness and

standard of healthcare services. According to Shiferaw *et al.* (2017) the quality of the data is measured in four main dimensions: relevance, completeness, timeliness and accuracy. The quality of data based on the dimension of timeliness in the treatment group ("PSG Balita" application on the Android platform) only requires a shorter time in processing data, has better quality in recording and reporting nutrition and the fulfillment of timely reporting to the health office level. Meanwhile, for the group that was trained manually, proving to be on time is also a top priority, namely data and information on the nutritional status of toddlers from the Health Center must be delivered on time, but it is constrained by access or distance from the Health Center to the Health Office, and there is no definite agreement on when nutrition data will be. It must be collected at the health department.

The data completeness factor in the treatment group using the "PSG Balita" application on the Android platform has more complete data in fulfilling information on the nutritional status of toddlers, such as indicators of WHZ, WLZ, HAZ, LAZ, WAZ, and BAZ both on the z-score and nutritional status category. Compared to completeness in the control group, the completeness of information on nutritional status data for children under five is only the WHZ, WAZ and HAZ index, and this is a result of the length of time nutrition workers take in the data processing. On the other hand, the nutritionists that use the "PSG Balita" application only takes a short time to process nutritional data to be complete. The existence of information and technology in the health sector has improved quality and work processes as well as increased efficiency values, starting with knowledge and positive user responses to the level of effectiveness as a more important basis (Liu *et al.*, 2018). Substantial

factors, seriousness and tenacity, and their awareness to give their best demands to become proficient in using application-based WHO reference standards. Jones *et al.* (2014) reported that the number of wishes of each user in utilizing the data depends on the completeness and quality of the data itself so that it can support the decisions taken.

The study's results (Table 3) showed an increase in the average score between before and after training up to one month of implementation. In addition, the quality of the information in the group using the "PSG Balita" application on the Android platform has a more excellent average than the manual. The average percentage difference in the quality of information between groups shows an increase between before training, after being given training, and one month after training/implementation. The effectiveness of the training provided, as well as the application of "PSG Balita" between application-based and manual, showed that those who received training using applications had better effectiveness in increasing the value of nutritional data and information (p<0.05).

The dimension of the accuracy of the data obtained from using the "PSG Balita" application on the Android platform is very significant. The nutritionist that uses the application can increase the accuracy of the nutritional status data of toddlers to 93.8% compared to calculations and manual checks. Good accuracy as a result of checking through the application by Health Officers. Data sent by a nutritionist in the form of softcopy results from "PSG Balita" processing, where the existing data entry is readjusted with all the data in the files of each village in each Health Center. Information with good accuracy means that the resulting information or data

Table 3. Effectiveness of data quality and nutritional status Information between using the "PSG Balita" application and manuals.

In terms of data and information quality	Implementation of WHO growth standards by training group					
	Pre-training		After the training		After one month the training	
	Mean±SD	Sig.	Mean±SD	Sig.	Mean±SD	Sig.
Timeliness (%)						
Application	68.2±6.752	0.049	70.0±6.208	0.012	85.3±9.725	0.001
Manual	56.7±8.983		59.2±9.406		73.3±6.179	
Completeness (%)						
Application	61.4±6.718	0.035	72.3±5.626	0.030	93.3±4.510	0.000
Manual	66.5±5.510		67.9±6.813		67.5±6.813	
Accuracy (%)						
Application	75.2±6.078	0.372*	85.9±5.750	0.001	93.8±6.510	0.000
Manual	73.8±7.166		75.6±4.373		77.7±5.846	
Usefulness (%)						
Application	84.6±7.667	0.318*	86.7±5.596	0.482*	93.8±5.103	0.035
Manual	86.9±7.478		88.2±5.308		91.2±4.783	

SD: Standard deviation, *Not significant at 95%.

must be free from errors and not biased toward its users. It is because of the development of an application with a higher probability of producing accurate nutritional status data (Rana *et al*., 2021). The more accurate the information provided, the more valuable it is for all users of the information, especially for decision-makers or nutritionists (Khan *et al*., 2018).

According to Bervell and Al-Samarraie (2019) the dimension of usefulness can be used and utilized as well as feedback for decision-making for the recipients of information, and routinely establish and maintain a systematic monitoring and evaluation mechanism. The study found that the benefits obtained from the use of PSG Balita in providing data and information on nutritional status were very useful for the benefit of monitoring nutritional status and planning nutritional activities and could help prevent stunting, prevent obesity and control malnutrition and malnutrition. Meanwhile, in the control group, the benefits obtained from data on nutritional status are still small because they can only plan for controlling undernutrition and malnutrition. Johnson *et al*. (2012) believes that the use of WHO growth standards is an appropriate reference for measuring the prevalence of nutrition in an area. In addition, according to Ham *et al*. (2015), it is possible to make advancements in information technology in the health industry and reap good results. Additionally, cost-effectiveness can be stressed. A learning program should be expanded to include formal training to provide high-quality information and to enable health professionals to be better and more qualified in their work. Education and training through the learning and involvement of public health workers have led to innovative developments in education and training in the field of education and training. Public health, including engagement with professionals with no previous exposure to public health (Hahn and Truman, 2015).

Based on the results of the study, it has been shown that interventions in the form of training and the application of WHO growth standards using applications have proven to be more effective than manual interventions in improving the quality of data and information on the nutritional status of toddlers in Aceh Province. A good training design model is needed for the effectiveness of intervention implementation. The concepts such as motivation, learning styles, effectiveness, and several other approaches, become very important in producing practical training (Goetzel *et al*., 2014). Measuring a good quality information requires various supporting aspects. Shiferaw *et al*. (2017) reported that the quality of information data can be seen and measured according to aspects of relevance, completeness, timeliness and accuracy.

The explosion of information technology growth, such as the industrial revolution 4.0, has changed all elements related to the work system (Goetzel *et al*., 2014). Research results have proven that interventions carried out by providing training and implementing using anthropometric applications have an excellent acceleration in changing the knowledge of nutrition workers in health centers and have been able to improving the quality of data on children's nutritional status. The training intervention model designed and developed using a digital information technology approach shows better progress in changing nutrition workers' understanding in the field. These results are supported by de Onis *et al*. (2007) that in assessing or monitoring nutritional status in community groups, the utilization of the WHO Anthro application has facilitated the model and increased the validity of the data, both incoming data and generated data, and this is the most necessary thing. Meanwhile, according to Johnson *et al*. (2012) the use of WHO growth standards is an appropriate indicator for measuring nutritional prevalence. Therefore, it is necessary to use technology-based equipment to process data so that it can positively improve the accessibility of information, fast data processing, and good data storage and presentation. The use of the WHO standard application is better for predicting nutritional problems than the CDC-2000. Healthcare practitioners are very appropriate to use the WHO growth standard in assessing children's growth (Chowdhury *et al*., 2019). Pediatricians who monitor children's growth under six months tend to use the WHO growth chart for more evaluation—advanced in detecting growth and development (Mei and Grummer-Strawn, 2011). The results of other studies also suggest that the use of the WHO standard is excellent in determining nutritional status, especially at the beginning of growth. Silveira *et al*. (2011) found that using graphs from the WHO reference standard is better in screening children's nutritional status because it allows the detection of the number of undernourished children with a higher nutritional risk than the CDC and NCHS charts. According to de Onis *et al*. (2007) the WHO growth standard was carried out on healthy children who received exclusive breastfeeding and lived in a healthy environment, with more frequent measurements (weekly, monthly for infants 0-24 months), so it was very good at monitoring growth in infancy (under six months). While the CDC standards for exclusively breastfed children are very few, the CDC curve is not good at explaining the rate of weight gain at the beginning of the baby's growth.

The intervention in the form of training and implementation of WHO growth and development standards aim to increase nutritional data and information and its quality and is possible as a

supporting factor in policy making and decisions by leaders related to planning and implementing nutrition programs. In addition, these interventions can be a competitive value in the work environment, which can significantly increase efficiency and quality and create a better system. The ability to advance information technology is essential in an organization. The generalization capability and the level of effectiveness of the system become a tool in supporting the health care process. Associated with the implementation of nutritional monitoring as well as the growth and development of children under five, the effectiveness of the success of a program is from the process of accuracy in measurement as one of the most influential factors.

The management of an organization/institution requires information that considers aspects of accuracy and timeliness, which aims to facilitate the process of making decisions, planning and controlling effectively. The information must be available and have value in making decisions and dealing with problems and results, and this process continues until the final stage of problem-solving. The supervisor also supports the success of a training intervention. Supervisors in an organization become the basis for feedback in improving human resources, namely through education, training and development. It is a series of process activities that positively improve the quality of activity program reports. The ultimate goal is to improve skills in their respective fields so that the results obtained during the intervention will help make decisions (Mitsunaga *et al.*, 2013). Therefore, each Health Center must directly and continuously monitor activities in the field through supervisors. Monitoring and supervision activities by nutritionists in the field are necessary for policymakers to determine growth and development monitoring programs or nutrition monitoring (Holschneider *et al.*, 2021).

4. Conclusion

The use of WHO growth standards using the "PSG Balita" application on the Android platform as well as manual/conventional has a major impact on improving the accuracy of information about toddlers' nutritional status. Information on the nutritional status of toddlers is of higher quality in terms of timeliness, completeness, accuracy and usefulness by using the "PSG Balita" application on the Android platform compared to the manual, namely Regulation of the Minister of Health of Indonesia, No. 2 of 2020 concerning Child Anthropometry Standards.

Conflict of interest

The authors declare no conflict of interest.

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