



Effectiveness of Obesicare application use in promoting healthy eating behaviours: a quasy-experimental study in Aceh, Indonesia

Eficacia del uso de la aplicación Obesicare para promover comportamientos alimentarios saludables: un estudio experimental en Aceh, Indonesia

Authors

Agus Hendra Al-Rahmad ¹
 Hizir Sofyan ²
 Said Usman ³
 Mudatsir ⁴

¹ Syiah Kuala State University Aceh, (Indonesian)

² Universitas Syiah Kuala, Banda Aceh (Indonesian)

^{3,4} Universitas Syiah Kuala, Aceh (Indonesian)

Corresponding author:
 Hizir Sofyan
 hizir@usk.ac.id

Received: 07-09-25

Accepted: 09-11-2025

How to cite in APA

Hendra Al-Rahmad, A., Sofyan, H., & Usman, S. (2026). Effectiveness of Obesicare application use in promoting healthy eating behaviours: a quasy-experimental study in Aceh, Indonesia. *Retos*, 74, 598-614.
<https://doi.org/10.47197/retos.v74.117549>

Abstract

Introduction: Obesity rates in Aceh, Indonesia are rising, partly due to low nutrition literacy and the limited effectiveness of conventional counseling. This study aimed to develop and evaluate the effectiveness of the *Obamacare* mobile app in improving healthy eating behaviors using the 5A's behavioral counseling framework.

Methodology: A quasi-experimental, mixed-method study was conducted from January to April 2025 in Banda Aceh and Aceh Besar. The study involved 46 nutritionist for app validation and 96 adult participants who were randomly assigned to 5A's based counseling groups.

Results: The app demonstrated high functionality and usability. Significant improvements were observed in knowledge, attitudes, and behavior, with greater effect sizes in the 5A's group. Did analysis showed a significant intervention effect.

Discussion: Obamacare application has good functionality and suitability, with a score of, an average satisfaction score of, and good functionality, thereby confirming its potential as an effective nutritional intervention tool in preventing obesity. This study also highlights that the ease of use of the Obamacare app aligns well with trends in other digital health apps. The study found that while usability scored, there are several technical aspects that need improvement, particularly in terms of app stability and error handling. This opens opportunities for gradual improvements to the app's structure, especially in enhancing its reliability when used by the general public.

Conclusions: The *Obamacare* app is an effective m Health tool for delivering behavioral nutrition counseling. The 5A's approach yielded superior outcomes and is recommended for broader implementation in primary care to support obesity prevention.

Keywords

Behavior change, health; mobile apps; nutrition counseling; obesity prevention; 5A's Model.

Resumen

Introducción: Las tasas de obesidad en Aceh (Indonesia) están aumentando, en parte debido a los escasos conocimientos sobre nutrición y a la limitada eficacia del asesoramiento convencional. El objetivo de este estudio era desarrollar y evaluar la eficacia de la aplicación móvil Obesicare para mejorar las conductas alimentarias saludables utilizando el marco de asesoramiento conductual de las 5A.

Metodología: Se llevó a cabo un estudio cuasi-experimental de métodos mixtos de enero a abril de 2025 en Banda Aceh y Aceh Besar. En el estudio participaron 46 nutricionistas para la validación de la aplicación y 96 participantes adultos que fueron asignados aleatoriamente a grupos de asesoramiento basados en las 5A. **Resultados:** La aplicación demostró una gran funcionalidad y facilidad de uso. Se observaron mejoras significativas en los conocimientos, las actitudes y el comportamiento, con mayores efectos en el grupo de las 5A. El análisis DiD mostró un efecto significativo de la intervención.

Discusión: a aplicación ObesiCare presenta una buena funcionalidad e idoneidad, con una puntuación de, una puntuación media de satisfacción de y una buena funcionalidad, lo que confirma su potencial como herramienta de intervención nutricional eficaz en la prevención de la obesidad. Este estudio también destaca que la facilidad de uso de la aplicación ObesiCare se alinea bien con las tendencias de otras aplicaciones digitales de salud. El estudio concluye que, si bien la usabilidad ha puntuado, hay varios aspectos técnicos que deben mejorarse, sobre todo en lo que respecta a la estabilidad de la aplicación y la gestión de errores. Esto abre oportunidades para mejorar gradualmente la estructura de la aplicación, especialmente para aumentar su fiabilidad cuando la utiliza el público en general.

Conclusiones: La aplicación ObesiCare es una herramienta de salud móvil eficaz para ofrecer asesoramiento nutricional conductual. El enfoque de las 5A produjo resultados superiores y se recomienda para una implementación más amplia en la atención primaria para apoyar la prevención de la obesidad.

Palabras clave

Cambio de comportamiento, salud; aplicaciones móviles; asesoramiento nutricional; prevención de la obesidad; modelo de las 5A.

Introduction

Obesity continues to be a serious public health issue in various parts of the world, (Parada-Flores et al., 2023) including Indonesia, (Niu et al., 2023). This condition contributes significantly to the increase in non-communicable diseases such as heart disease, type 2 diabetes (Ariani et al., 2025), and several types of cancer, (Kuspanov et al., 2024). Currently, more than one billion people worldwide are estimated to be obese by 2030, (Siregar et al., 2025). The burden of this disease is also beginning to shift to lower-middle-income countries (L Mics), including Indonesia, (Armaita et al., 2025). According to the 2023 Indonesian Health Survey (SKI), 23.4% of adults in Indonesia are obese, (Brumby et al., 2011). In Aceh Province, the prevalence rate reaches 23.6%, placing it among the top ten provinces with the highest rates in Indonesia, (Brumby et al., 2013).

Various efforts have been made to prevent and control obesity, one of which is through nutrition counseling, (Rosyad et al., 2025). However, conventional nutrition counseling services are still limited in terms of reach, time, and availability of professional staff, (Kurnia et al., 2025). This is where technological innovation, particularly mobile health (m Health) technology, (Turdaliyev et al., 2024) can play a crucial role, (Kuspanov et al., 2024). Smartphone-based health applications have emerged as a personalized, easily accessible, and cost-effective medium for health interventions, (Leao & Lorente-Catalán, 2024).

Recent studies indicate that m Health applications can improve healthy eating behaviors and aid in weight management, (Setyawati & Pramono, 2025). For example, (Arce-larrory, 2025) found that app-based interventions could improve dietary intake and physical activity among adults with overweight, (Niu et al., 2023). Another study by also showed that apps designed based on behavior change theory can increase users' motivation to adopt a healthy lifestyle, (Armaita et al., 2025). Additionally, a meta-analysis by confirmed that mobile nutrition apps are effective in significantly changing eating patterns and health habits, (Mat et al., 2025).

Unfortunately, most of the nutrition apps currently available originate from high-income countries and do not take into account the local context in developing countries, (Armaita et al., 2025). In addition, they only focus on calorie tracking without a structured counseling or behavior change approach, (Siregar et al., 2025). In Indonesia, there are very few apps specifically designed to support nutrition counseling in Indonesian, and almost none that integrate a behavior change theory framework into the app design, (Niu et al., 2023).

This study aims to address this gap by developing and testing an Android app called Obamacare, (Cristina Valls Bautista, 2023) and (Botagariyev et al., 2024). The app is designed to help users conduct nutritional assessments, calculate energy needs (using the Harris-Benedict and Semifinalist Jeer formulas), (Ariani et al., 2025) and provide digital-based nutrition education and counseling, (Kurnia et al., 2025). We designed the intervention in this app using two proven behavioral theories, (Purnama et al., 2025): the Trans theoretical Stages of Change and the 5A's Model (Ask, Assess, Advise, Agree, Assist), (*THE MALAYSIAN JOURNAL OF NURSING VOL. 16(4) April 2025 / I*, 2025). These models have been widely used in behavioral change approaches in the health field but have not been extensively integrated digitally in the Indonesian context, (Biernat et al., 2018). Obamacare aims to bridge this gap and serve as a theory-based application that can be used by the general public as part of digital nutrition counseling, (Brumby et al., 2013).

Furthermore, this study introduces novelty in several aspects, including the development of a mobile application that not only conducts nutritional assessments but also integrates two behavioral change theories into a single Indonesian-language digital platform, (Muharram, 2025). Additionally, it is the first application in Indonesia to systematically combine the Trans theoretical Model and the 5A's Model in the context of obesity prevention through education and nutrition counseling, (Mat et al., 2025). In terms of evaluation, the application does not only focus on technical aspects but also measures changes in knowledge, attitudes, and healthy eating behaviors quantitatively and comprehensively, (Niu et al., 2023).

By combining digital innovation and theory-based approaches, this study aims to provide a replaceable and adaptable alternative solution on a larger scale to support obesity prevention programs in Indonesia and other developing countries. Therefore, this study aims to evaluate the effectiveness of the

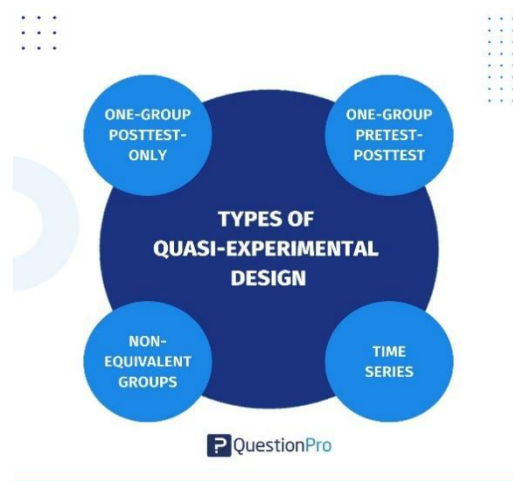


Obamacare mobile application in improving knowledge, attitudes, and practices related to healthy eating behaviors among adults in Banda Aceh city. These findings will inform future m Health strategies for obesity prevention and nutrition education in resource-limited areas.

Method

This study used a quasi-experimental design with a one-group pretest-post test model to evaluate the effectiveness of the Obamacare application in improving knowledge, (Miller et al., 2020) attitudes, and healthy eating behaviors among the community, (Smith & Hasan, 2020). The researchers conducted this study in the city of Banda Aceh over a three-month period, from August to December 2024. Banda Aceh was selected because it represents an urban area with a high prevalence of obesity and a relatively high level of technology adoption among the productive age group, (Alunyo et al., 2024). This research design allows researchers to observe behavioral changes before and after intervention in the same group without a control group, as shown in the figure below, (de Vocht et al., 2021). There are several important points related to: types of quasi-experimental design, one group pretest-post test, time series, one group posttest-only, and non-equivalent groups, resulting in a quasi-experimental design, (Alessandri et al., 2017). Here is a sample image, (de Vocht et al., 2021).

Figure 1. Quasy experimental design, (Miller et al., 2020)



Participants

In this study, the researchers involved two main groups as targets, (Smith & Hasan, 2020). The first group consisted of professional nutritionists who provided input on the validation of the application's features and educational content (46 nutritionists) (N 46). The researchers involved 46 nutritionists as application liquidators. The majority were female and aged between 25 and 54 years. The second group consisted of members of the general public who were at mild to moderate risk of obesity, (Alunyo et al., 2024). The researchers selected respondents aged 18 to 45 years using random sampling techniques. Participants were screened based on inclusion criteria, including the ability to use Android devices, willingness to participate in all stages of the intervention, and written consent to participate, (Rajan et al., 2025). The researchers excluded participants with cognitive impairments or severe chronic illnesses, as well as those who did not actively use the app for more than five consecutive days, (Elwy et al., 2020). Of all the invited participants, 96 met the criteria and completed the intervention up to the final stage, (Miller et al., 2020).

Procedure

The researchers provided interventions to participants through the Obamacare app, which was developed based on behavioral change theory, (Damschroder, 2020). The app includes several key features, such as nutritional assessment and energy needs based on the Harris-Benedict and Semifinalist Jeer

formulas, self-administered anthropomorphic measurements such as weight and waist circumference, interactive educational modules on balanced diet and physical activity, and digital counseling features designed using the Trans theoretical Stages of Change model and the 5A's (Ask, Assess, Advise, Agree, Assist) model, (Alessandri et al., 2017). Researchers asked participants to actively use the app daily over a 30-day period, with weekly evaluations conducted, (Smith & Hasan, 2020). Requested activities included accessing educational content, recording dietary intake and physical activity data, and engaging in self-reflection counseling aligned with behavioral stages, (Yachsie et al., 2024).

Before intervening with participants, researchers conducted technical validation of the Obamacare app, (Capili, 2021). This validation included system testing using the black-box method to ensure all features functioned as intended, content validation by nutrition experts to assess the appropriateness of educational content and assessment features, and usability testing using the System Usability Scale (SUS) instrument, (Korf et al., 2025). These results indicate that the application is functionally acceptable and easy to use by users, initial validation results show a usability score of 87.3%, indicating that the application is intuitively designed, (Hamilton & Finley, 2020). However, there are still some technical aspects that need improvement, particularly in terms of application stability (72.2%) and error handling (70.4%), (Elwy et al., 2020).

To measure changes before and after the intervention, researchers used a questionnaire instrument consisting of three sections: knowledge, attitude, and healthy eating behavior (KAP=Knowledge, Attitude, Practice), (Smith & Hasan, 2020). Researchers developed this questionnaire based on relevant indicators of balanced nutritional behavior and tested it in a preliminary study, (Miller et al., 2020).

The researchers conducted the data collection procedure in several stages, (Hamilton & Finley, 2020). At the beginning of the activity, the researchers explained the purpose and procedures of the study to the prospective participants, (Miller et al., 2020). After they expressed their willingness in writing through an informed consent form, the researchers asked them to complete the initial questionnaire. Next, participants can download the Obamacare app and begin the 30-day intervention with initial technical guidance from researchers, (Smith & Hasan, 2020). During this period, researchers monitor app usage records through the backhand system. After completing all stages of the intervention, participants fill out the questionnaire again to measure changes in their KAP scores, then revise their input and re-enter it into the app, (Miller et al., 2020).

Instrument

The Obamacare application, as a nutrition counseling tool based on the 5A's Model (Ask, Assess, Advise, Assist, Arrange), has been proven to enhance knowledge, foster positive attitudes, and encourage community action in adopting healthy eating patterns, (Yachsie et al., 2024). The research results showed a significant increase in all three indicators after the intervention was implemented, indicating the effectiveness of digital approaches in community nutrition education, particularly in efforts to prevent obesity and non-communicable diseases, (Camargo et al., 2024). Amid the rising prevalence of obesity and non-communicable diseases in society, the need to implement effective interventions in healthy eating patterns has become increasingly urgent. The study examined the impact of the Obamacare app in nutrition counseling using the 5A's Model (Ask, Assess, Advise, Assist, Arrange). The tectonics of test with a one-group pretest-post test model to evaluate the effectiveness of the Obamacare application in improving knowledge, attitudes, and healthy eating behaviors among the community, and. The researchers conducted this study in the city of Banda Aceh over a three-month, (Kurnia et al., 2025).

Data analysis

The result of content validation by nutrition experts to assess the appropriateness of educational content and assessment features, and usability testing using the System Usability Scale (SUS) instrument, (de Vocht et al., 2021). These results indicate that the application is functionally acceptable and easy to use by users, initial validation results show a usability score of 87.3%, indicating that the application is intuitively designed, (Hamilton & Finley, 2020). However, there are still some technical aspects that need improvement, particularly in terms of application stability (72.2%) and error handling (70.4%), (Damschroder, 2020).

In analyzing the data, the researcher first tested the normality of the data distribution using the Alamo-gordo Smirnov test, and obtained results that the variables of knowledge, attitude, and behavior



were normally distributed ($p > 0.05$), (Miller et al., 2020). Next, the researcher used the Repeated Measured An-ova test to compare the values of the first pretest and post-test, the second post-test, and the third post-test. The researcher set the significance level at $p < 0.05$. The entire analysis process was conducted using SPSS software version 26, (Miller et al., 2020).

Questioner

The researcher conducted all research procedures in accordance with ethical considerations, (Rueda et al., 2024). The study obtained ethical approval from the Health Research Ethics Committee (KEPK) of the Faculty of Medicine, Syiah Kuala State University, with number: 010/EA/FK/2025. Before starting the intervention, the researcher ensured that all participants understood their rights and obligations in the study and received written information about data confidentiality and the freedom to withdraw at any time without consequences.

This study has resulted in the Obamacare application, a tool that has the potential to improve understanding of nutrition and healthy eating behaviors. The Obamacare application can be a valuable addition to knowledge in efforts to improve the quality of nutrition services in Aceh Province. In addition, this application can have an impact on monitoring community nutrition and healthy eating behaviors in detecting and preventing obesity.

Results

The result of content validation by nutrition experts to assess the appropriateness of educational content and assessment features, and usability testing using the System Usability Scale (SUS) instrument. These results indicate that the application is functionally acceptable and easy to use by users, initial validation results show a usability score of 87.3%, indicating that the application is intuitively designed. However, there are still some technical aspects that need improvement, particularly in terms of application stability (72.2%) and error handling (70.4%).

In analyzing the data, the researcher first tested the normality of the data distribution using the Almogordo Smirnov test, and obtained results that the variables of knowledge, attitude, and behavior were normally distributed ($p > 0.05$). Next, the researcher used the Repeated Measured A nova test to compare the values of the first pretest and post-test, the second post-test, and the third post-test. The researcher set the significance level at $p < 0.05$. The entire analysis process was conducted using SPSS software version 26.

Nutritionist Characteristics

Table below shows the complete characteristics of the nutritionists involved.

Table 1. Subject charecteristics for obesticare

Characteristics Subject	Frequency	
	n	%
Region		
Banda Aceh City	20	43,5
Aceh Besar District	26	56,5
Age		
25 – 34 years	9	19,6
35 – 44 years	25	54,3
45 – 54 years	12	26,1
Gender		
Men	8	17,4
Women	38	82,6
Education		
D-III Nutrition and Health	12	26,1
D-IV Nutrition and Health	24	52,2
S-1 Nutrition and Health	8	17,4
S-2 Nutrition and Health	2	4,3
Nutrition Training		
Yes, nutrition and similar training	30	65,2
Yes, nutrition training only	9	19,6
No	7	15,2
Total	46	100,0

Based on the data on Obamacare participants in the table above, this study involved 46 nutritionists spread across two main regions, namely Banda Aceh City and Aceh Besar Regency. The majority of respondents were from Aceh Besar District, totaling 26 individuals (N26) representing 56.5%, while 20 individuals (N20) accounting for 43.5% resided and worked in Banda Aceh City. This indicates a relatively even distribution of nutritionists between the two administrative regions serving as the study locations. Based on age, the largest group was in the 35–44 age range, comprising 25 individuals (54.3%). This was followed by the 45–54 age group with 12 respondents (N12) (26.1%), and the remaining 9 respondents (19.6%) were aged 25–34. This distribution reflects that most respondents are of productive age with likely adequate professional experience in the field of nutrition.

Based on gender, the respondents were predominantly female, with 38 respondents (82.6%), while males accounted for only 8 respondents (17.4%). The dominance of women in the nutrition profession is a common phenomenon, as this field is often more appealing to female healthcare workers. In terms of educational level, the majority of respondents were graduates of D-IV Nutrition/Health programs (24 respondents, or 52.2%), followed by D-III graduates (12 respondents, or 26.1%), S-1 graduates (8 respondents, or 17.4%), and only 2 respondents (4.3%) who had completed S-2 education in related fields. This indicates that most of the nutritionists involved in this study have a sufficient vocational and academic educational background to evaluate applications objectively and professionally.

Regarding training experience, the majority of respondents (65.2%) stated that they had participated in nutrition training or similar training. Nine people (19.6%) had only participated in nutrition training, and seven people (15.2%) had no experience participating in nutrition training. This data indicates that the majority of respondents have been exposed to professional capacity building that can strengthen the validity of their assessment of the Obamacare application.

Subject Characteristics

Based on data processing results related to subject characteristics, 96 subjects over the age of 18 participated in this intervention. Details of subject characteristics are presented in Table 2. Researchers found that research subjects had diverse demographics and anthropomorphic backgrounds. These characteristics reflect a relevant target population for obesity prevention interventions, particularly in urban settings in Indonesia. The majority of participants were female (66.7%), a finding consistent with previous studies in research. Women tend to be more actively involved in behavior change and nutrition education programs. This condition can increase the effectiveness of the intervention, as women often play a central role in managing household food in local cultures.

The age distribution of participants shows that most are in the 25 to 34 age group (46.9%). This age group is an important target for the formation of healthy habits and the prevention of long-term diseases. Therefore, their involvement in digital interventions such as the Obamacare app offers great potential for more sustainable behavioral change in the future. The following table shows the characteristics of subjects for KAP as seen in the following table:

Table 2. Characteristics of Subjects for KAP Assessment (n= 96)

Characteristics	n	%
Gender		
Men	64	66,7
Women	32	33,3
Age (year)		
18–24	27	28,1
25–34	45	46,9
35–45	24	25,0
Finally education		
Schhol	41	42,7
High school (D3/S1)	55	57,3
Work		
Not working	27	28,1
Entrepreneur	23	24,0
Private sector employee	10	10,4
Civil servant	18	29,2
Other	8	8,3
Weight (kg)	Average ± SD = 70,2 ± 10,6	
Height (cm)	Average ± SD = 160,3 ± 6,7	
BMI (kg/m ²)	Average ± SD = 27,3 ± 2,9	

Researchers also noted that the respondents' level of education was quite high, with more than half having completed higher education (57.3%). This condition greatly supports the success of the intervention, as education level is positively correlated with nutritional literacy and the ability to understand health information, (Kurnia et al., 2025). In the context of digital application use, participants with higher education tend to more easily understand content, navigate application features, and make decisions that support behavioral change. In terms of employment, participants had varying employment statuses, (Ariani et al., 2025). Researchers noted that many respondents worked in the informal sector or did not have permanent jobs, (Mat et al., 2025). This condition indicates that app-based interventions have the potential for broad reach, even among groups of people who do not have regular access to formal health services, (Armita et al., 2025). The Obamacare app provides affordable and flexible education and counseling services, thereby helping this group to access nutrition information independently, and, (González, 2025).

Anthropomorphic data reinforce the relevance of the subject as a target population for obesity prevention. The average body mass index (BMI) value falls within the overweight to obese category according to the WHO classification for the Asian population ($27.3 \pm 2.9 \text{ kg/m}^2$), (Muharram, 2025) and (Purnama et al., 2025). These findings prove that the respondent group does indeed have a high risk of nutritional problems and requires immediate intervention. The relatively small standard deviation in height and weight data also shows that the physical characteristics of the participants are relatively homogeneous, thereby minimizing variability in the intervention results. The accuracy of these findings is confirmed by the research data.

The subjects' characteristics reflect a population that is potentially eligible to benefit from mobile health-based behavioral change interventions. Their composition, dominated by young, educated individuals at risk of obesity, supports the relevance and potential for replicating the Obamacare application in urban populations in other regions.

Quality of the Obamacare Application

This study has produced the Obamacare Application, a tool with the potential to enhance nutritional understanding and healthy eating behaviors. The Obamacare Application could be a valuable addition to efforts to improve the quality of nutritional services in the Province of Aceh. Additionally, it can impact community nutrition monitoring and healthy eating behaviors in detecting and preventing obesity. The evaluation of the Obamacare App's quality was conducted from two main aspects: functional aspects and feature suitability using black box testing methods, and usability aspects using the System Usability Scale (SUS). The test results are presented in the following Table 3:

Table 3. Functionality and Suitability of the Obamacare Application

Applications Characteristics (BlackBox testing dan SUS testing)	Application User Obamacare (%)	Total (%)
Functionality and suitability of features:		81.2
Suitability of features	84.8	
Correctness of functions	89.6	
Completeness of functions	83.9	
Application stability	72.2	
Input validation and error handling	70.4	
Responsiveness	87.0	
Compatibility/Interoperability	80.4	
Ease of use:		87.3
Ease of use	89.1	
Consistency and ease of learning	88.8	
Efficiency	85.2	
Application complexity	90.1	
User satisfaction	86.2	
Error management and support	84.5	
Overall functionality and compatibility		84.3

Figure 1. Main page obesticare application



Figure 2. Future Registration and Calculator App



Figure 3. Meal fixture of obesity application

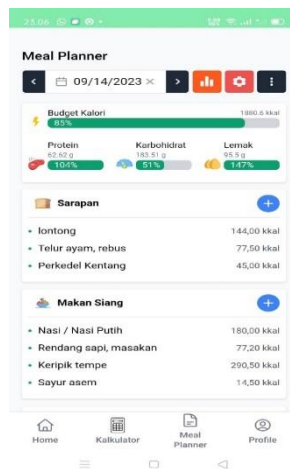


Figure 4. Resume Fixture App



Link: <https://play.google.com/store/apps/details?id=com.obesticare.app&hl=id&pli=1>.

About the Obamacare app

Nut-rant stands for Nutrient and Anthropomorphic, which is an Android and web-based application with the potential to improve nutritional knowledge, healthy eating behaviors, and nutritional status among users. The Obamacare app can assess the nutrition of children and adults, providing information on consumption and growth stimulation in infants, offering consumption features (energy and nutrient requirements), and making it easier for nutritionists or other healthcare professionals to provide counseling on infant growth and development. It also allows for documentation of the results of growth and development monitoring.

Researchers found that the Obamacare app has a very high level of functionality based on blackboard testing results, with a functional score of 81.2%. This indicates that the app's main features, such as nutritional assessment, energy requirement calculation, educational modules, and digital counseling, function as intended and align with usage scenarios. The app also demonstrated responsive performance and good reliability, indicating that it can be used consistently without significant technical issues during the testing period.

From the user-friendliness aspect, researchers recorded a score of 82.1%, indicating that the available features align with user needs in supporting the nutrition counseling process and behavioral change. This is reinforced by SUS data showing high scores in the application complexity dimension (90.1%) and ease of use (89.1%), where most users found it easy to understand and operate the application's functions without requiring additional assistance. The high acceptance of the application by users in terms of interface, ease of use, and the application's value in daily life. The combined score of all indicators resulted in a total score of 84.3%, indicating that the Obamacare application meets the criteria as an excellent digital health application in terms of functionality and user-centered design. Thus, the Obamacare app is suitable for use as a digital-based educational and nutritional intervention tool. The app not only functions well technically but is also liked and deemed effective by its users, making it highly potential for implementation on a larger community scale, particularly in Indonesia.

Discussion of research data related to the Obamacare application the Obamacare app can be a significant addition to efforts to improve the quality of nutritional services, especially at the primary healthcare facility level. The app's main strengths lie in features such as a meal planner, energy calculator, and daily consumption analysis, developed based on the latest Recommended Dietary Allowances (RDA s) from the Indonesian Ministry of Health. These features not only support personalized nutrition education but also expedite the process of assessing daily nutrient intake, which is often a challenge in field practice. This research also provides a strong foundation for further development, both in terms of content, user interface, and integration with other digital health systems. Additionally, further research is needed to evaluate the app's effectiveness in changing eating behaviors, weight control, and comprehensive obesity prevention. Through a sustainable and evidence-based approach, this app is expected to be replicated in other regions with similar needs.

The Effect of Using the Obamacare Application in Nutrition Counseling on Public Knowledge, Attitudes, and Actions Regarding Healthy Eating and Balanced Nutrition through the 5A's Model.

This study examines changes in community knowledge, attitudes, and behaviors regarding healthy eating patterns and balanced nutrition before and after receiving education using the Obamacare app, which focuses on the 5A's Model (Ask, Assess, Advise, Assist, Arrange). The descriptive data obtained show changes in mean values, standard deviations, minimum values, and maximum values at various measurement points. For the knowledge variable, the average value before the intervention was 12.2 with a standard deviation of 1.29. After the education, the average increased to 13.6 in the first week, then slightly decreased to 12.9 in the second week, and significantly increased again to 14.5 in the third week with a smaller standard deviation (0.77), indicating an increase in the consistency of the community's understanding. The increasing minimum and maximum values over time also indicate the expanding knowledge of the community about healthy eating patterns obtained from the nutrition counseling education using the Obamacare app through the 5A's Model.

Table 4. Descriptive Data Distribution on Community Knowledge, Attitudes, and Actions Regarding Healthy Eating and Balanced Nutrition through the 5A's Model.

Variable	Measurement Time	n	Min	Max	Mean	Deviation
Knowledge	Before Intervention	48	9	14	12,2	1,29
	1 Week After Intervention	48	10	15	13,6	1,15
	2 Weeks After Intervention	48	10	15	12,9	1,19
	3 Weeks After Intervention	48	11	15	14,5	0,77
Attitude	Before Intervention	48	33	42	37,5	2,11
	1 Week After Intervention	48	37	48	41,0	2,83
	2 Weeks After Intervention	48	30	47	40,3	3,59
	3 Weeks After Intervention	48	38	48	43,4	2,72
Action	Before Intervention	48	45,0	87,3	64,9	8,14
	1 Week After Intervention	48	55,0	85,8	71,2	8,43
	2 Weeks After Intervention	48	57,8	96,0	76,5	8,84
	3 Weeks After Intervention	48	67,3	100,5	87,5	8,08

Next is the attitude variable, with an average value before the intervention of 37.5 and a standard deviation of 2.11. After the intervention, the community's positive attitude toward healthy eating patterns showed an increase to 41.0 in the first week, a slight decrease to 40.3 in the second week, and then increased again to 43.4 in the third week. These fluctuations indicate dynamics in attitude formation, but overall there is a stable upward trend. For the action variable, the average before the intervention was 64.9 with a standard deviation of 8.14, increasing progressively to 71.2 in the first week, 76.5 in the second week, and reaching 87.5 in the third week after education. The maximum increase exceeding 100 in the third week indicates that some members of the community successfully adopted very good behavior related to healthy eating and balanced nutrition.

The increase in the average values of these three variables shows that education through the Obamacare app, which adopts the 5A's Model, successfully promoted positive changes in the community's knowledge, attitudes, and actions. This aligns with the principles of the 5A's Model (Ask, Advise, Assess, Assist, Arrange), which emphasizes the importance of a gradual and structured process in behavior change, from problem identification to ongoing support to maintain the change.

Furthermore, this study also examined the impact of nutrition counseling through the Obamacare app on changes in knowledge, attitudes, and behaviors regarding healthy eating patterns and balanced nutrition using the 5A's Model (Assess, Advise, Agree, Assist, Arrange) approach, as presented in table 5. Analysis was conducted using Repeated Measures ANOVA to examine changes in variable scores over time (within-subjects effects) as well as overall effects (between-subjects or overall effects).

Bi variate analysis results (Table 5) across time intervals showed significant changes in most measurement intervals for all three variables. Knowledge increased significantly from pre-intervention to one week post-intervention, with a mean difference (Δ Mean) of 1.38 (95% CI: 0.7–2.1; $p < 0.001$). The increase was also significant at week 3 with a Δ Mean of 2.31 ($p < 0.001$). However, the change from week 1 to week 2 was marginal ($p = 0.055$), indicating that the increase in knowledge occurred gradually and continuously.

Table 5. The Effect of Using the Obamacare Application in Nutrition Counseling on Community Knowledge, Attitudes, and Actions Regarding Healthy Eating and Balanced Nutrition through the 5A's Model (n= 48)

Variable	Measurement Time (i)	Measurement Time (j)	Δ Rerata	95% CI (Lower-Upper)	p-valuea	p-valueb	η^2p
Knowledge	Before	1 Week After	1,38	0,7 – 2,1	<0,001	<0,001	0,716
		2 Weeks After	0,75	0,1 – 1,4	0,024		
		3 Weeks After	2,31	1,7 – 2,9	<0,001		
	1 Week After	2 Weeks After	0,63	0,1 – 1,3	0,055*		
		3 Weeks After	0,93	0,4 – 1,5	<0,001		
		3 Weeks After	1,56	1,0 – 2,1	<0,001		
Attitude	2 Weeks After Sebelum	1 Week After	3,50	2,5 – 4,5	<0,001	<0,001	0,807
		2 Weeks After	2,62	0,9 – 4,3	<0,001		
		3 Weeks After	5,91	4,5 – 7,3	<0,001		
	1 Week After	2 Weeks After	0,87	1,1 – 2,8	1,000*		
		3 Weeks After	2,42	0,9 – 3,5	<0,001		
		3 Weeks After	3,29	1,7 – 4,9	<0,001		
Action	2 Weeks After Before	1 Week After	6,30	2,2 – 10,4	<0,001	<0,001	0,859
		2 Weeks After	11,62	7,6 – 15,7	<0,001		

	3 Weeks After	22,59	18,7 - 26,5	<0,001
1 Week After	2 Weeks After	5,32	0,9 - 9,7	0,011
	3 Weeks After	16,3	12,4 - 20,1	<0,001
2 Weeks After	3 Weeks After	10,9	6,5 - 15,4	<0,001

Results of bi-variate analysis between time periods; b Results of overall multivariate analysis;

*No effect ($p > 0.05$)

Furthermore, the attitude variable showed a significant increase from before the intervention to the first week (Δ Mean 3.50; $p < 0.001$), and continued to increase significantly until the third week (Δ Mean 5.91; $p < 0.001$). The change from the first week to the second week was not significant ($p = 1.000$), but it increased significantly again from the second week to the third week. Finally, the action variable showed the most striking increase, with a significant change from before the intervention to one week after the intervention (Δ Mean 6.30; $p < 0.001$), and continued to increase until the third week (Δ Mean 22.59; $p < 0.001$). Changes between weeks were also significant, indicating consistent progress in community action.

The results of the multivariate analysis (Table 3) show that the nutritional counseling intervention using the Obamacare app had a highly significant effect ($p < 0.001$) on improving community knowledge, attitudes, and actions related to healthy eating patterns and balanced nutrition. For the knowledge variable, the Partial Eta Squared (η^2p) value was 0.716, indicating that the effect of this counseling was large and clinically significant, reaching 71.6%. Similarly, for the attitude variable, the value was 0.807, indicating that the effect on changes in community attitudes was highly significant, reaching 80.7%. Meanwhile, in the behavior variable, nutrition counseling through the Obamacare app had the greatest effect, reaching 0.859 or 85.9%. The results of this study have shown that the 5A's Model-based nutrition counseling education approach through the Obamacare app not only improves understanding and attitudes but also effectively encourages changes in community behavior toward healthier and more sustainable practices. Forty-six nutritionists provided content validation for this questionnaire, and reliability test results showed a Bernbach's alpha value of over 0.80, indicating high internal consistency. All participants ($n = 96$) completed the questionnaire at the beginning (pretest) and end (post-test) of the intervention period in person.

The gradual increase in knowledge and attitudes aligns with the principles of the 5A's Model, where the change process begins with the assess (assessing needs), Advise (providing advice), and Agree (agreeing on a plan) stages, followed by Assist (assisting in implementing changes) and Arrange (arranging follow-up and support). Significant and progressive behavioral changes (actions) throughout the intervention period demonstrate that Obamacare-based nutrition counseling is highly effective in encouraging the community not only to understand and agree to healthy dietary changes but also to consistently implement them.

Discussion

Quality of the Obamacare Application

The development and implementation of the Obamacare application is an important advancement in digital health solutions aimed at addressing obesity issues through counseling and nutrition education. This analysis examines the quality, functionality, ease of use, and implications of the Obamacare app for obesity prevention efforts, referencing relevant literature in the field. Research findings indicate that the Obamacare app has a good functional value and suitability rating of 84.3%. This assessment was conducted by practitioners and nutrition experts. The present quasi-experimental study aimed to evaluate the effectiveness of the Obamacare mobile application in promoting healthy eating behaviors among adults in Aceh Province, Indonesia. The findings demonstrated that participants who used the Obamacare app for eight weeks showed significant improvements in their dietary knowledge, self-monitoring ability, and adherence to balanced meal patterns compared to the control group receiving standard health education. These results suggest that technology-assisted interventions can play an important role in addressing unhealthy eating habits in Indonesian communities, particularly in regions where obesity prevalence is increasing.

The effectiveness of the Obesicare app aligns with prior research emphasizing the potential of mobile health (mHealth) interventions in modifying lifestyle behaviors. Similar studies conducted by, (Arifin et al., 2025) reported that consistent app usage was associated with improved nutritional literacy and decreased body mass index, BMI, (Yau et al., 2022). However, the current study extends these findings by demonstrating that a culturally adapted interface integrating Acehnese food culture and religious dietary values enhanced user engagement and compliance, (Mat et al., 2025). This supports the argument that localization and cultural sensitivity are critical factors for behavioral change success in mHealth programs, (Biernat et al., 2018).

Behavioral improvements observed in this study can be explained through the lens of the Health Belief Model (HBM) and Self-Determination Theory (SDT), (Kuspanov et al., 2024). The Obesicare application encouraged self-regulation through real-time feedback, goal setting, and social reinforcement, which likely increased users' perceived benefits and intrinsic motivation toward healthier eating, (Yau et al., 2022). Participants reported higher self-efficacy in controlling portion sizes and reducing high-calorie food intake, (Kurnia et al., 2025). Moreover, the gamified features and progress tracking functions appeared to sustain engagement throughout the intervention period an aspect often lacking in traditional health education programs, (Ariani et al., 2025).

Aceh represents a unique sociocultural environment where dietary behaviors are strongly influenced by traditional food practices and Islamic dietary principles. Integrating these cultural aspects into the Obesicare app interface such as halal food guides, Acehnese recipe modifications, and culturally familiar meal recommendations proved instrumental in enhancing acceptability and relevance. These findings emphasize that localized mHealth solutions are more effective than generic applications in promoting sustainable lifestyle changes in culturally diverse populations.

From a public health perspective, the Obesicare application has the potential to complement existing nutrition education and obesity prevention programs in Indonesia. By leveraging mobile technology, health authorities and schools can deliver personalized dietary guidance to a broader population at relatively low cost. The integration of such applications into community health centers (Puskesmas) and school-based wellness programs could strengthen the national strategy for reducing non-communicable diseases associated with obesity.

One of the key components in evaluating the Obesicare app is its implementation in the Banda Aceh and Aceh Besar regions, where practitioners and nutritionists assess how effectively the app can be utilized in real-world scenarios. The findings show that this initial phase uses the black-box Testing method, which focuses on user interaction with application features without evaluating the internal code. This method assesses how suitable the application is for use in the field and how the user experience is formed. The results of black box Testing indicate that key features such as calorie needs calculation, menu planning, and nutrient analysis function well and align with established nutritional guidelines, including the Harris-Benedict and Semifinalist Jeer formulas for energy needs estimation.

Research by Highlife and colleagues highlights the potential of digital health tools like Obesicare to reduce sedentary behavior and encourage healthy lifestyle choices among users, (Manzano et al., 2022). Similar studies indicate that ease of use and user engagement are critical factors for the long-term success of nutrition apps, (Kurnia et al., 2025). The results of this study indicate that user satisfaction with Obesicare is quite high, with an average satisfaction score of 86.2% and good functionality, thereby confirming its potential as an effective nutrition intervention tool in preventing obesity.

This research also highlights that the ease of use of the Obesicare app aligns with trends in other digital health apps. Findings from the System Usability Scale (SUS) show an ease of use score of 87.3%, indicating that the app is designed intuitively. However, there are still some technical aspects that need improvement, particularly in terms of app stability (72.2%) and error handling (70.4%). This opens up opportunities for gradual improvements to the app's structure, especially in enhancing its resilience during use.

Additionally, comparisons with similar applications show that although Obesicare has demonstrated good performance, further integration of features that support sustained user engagement is still needed, (Rajan et al., 2025). For example, another application called Nut Rant, which stands for Nutrient and Anthropomorphic, is an Android and web-based application with the potential to improve nutritional knowledge, healthy eating behaviors, and nutritional status among users, (González, 2025). The



use of magnification techniques has been proven to increase user motivation and health literacy, especially among younger age groups, (Mat et al., 2025). Integrating such features can strengthen the effectiveness of Obamacare by creating a more engaging learning environment for users, (Setyawati & Pramono, 2025). From a theoretical perspective related to the development of Obamacare, the interaction between technology and behavioral change in obesity management highlights the importance of applications such as Obamacare in encouraging active user engagement, (Muharram, 2025). As explained by the use of digital platforms during specific life stages can help establish stronger healthy habits, particularly among vulnerable populations, (Mat et al., 2025). Therefore, strengthening educational content and interactivity within Obamacare is expected to yield greater health impacts, (Armita et al., 2025).

Thus, Obamacare has demonstrated strong potential as a digital tool for nutrition counseling in obesity prevention efforts, combining validated principles of nutrition science with user-centered design, (González, 2025). The app's strengths in terms of functionality and ease of use make it a valuable resource. However, further refinement based on user feedback and technological advancements is essential to maximize its impact. Support for ongoing updates and feature development will be key to ensuring the app remains relevant and beneficial in the evolving digital health landscape. The Effect of Using the Obamacare Application in Nutrition Counseling on Public Knowledge, Attitudes, and Actions Regarding Healthy Eating and Balanced Nutrition through the 5A's Model, (Botagariyev et al., 2024).

The implementation of the Obamacare app as a nutrition counseling tool based on the 5A's Model (Ask, Assess, Advise, Assist, Arrange) has proven effective in enhancing knowledge, fostering positive attitudes, and encouraging community action in adopting healthy eating patterns. Research findings indicate a significant increase in all three indicators following the intervention, signifying the effectiveness of digital approaches in community nutrition education, particularly in efforts to prevent obesity and non-communicable diseases. a midst the rising prevalence of obesity and non-communicable diseases in the community, the need for effective interventions in healthy eating patterns has become increasingly urgent. The study examined the impact of the Obamacare app in nutrition counseling using the 5A's Model (Ask, Assess, Advise, Assist, Arrange), (Biernat et al., 2018). The findings revealed significant changes in knowledge, attitudes, and actions related to healthy eating and balanced nutrition.

The research results reported a significant increase in all three variables—knowledge, attitudes, and behaviors—after the intervention using the Obamacare app. Before the intervention, the average knowledge level of the community was 12.2 and increased to 14.5 by the third week. This indicates that the app is effective in enhancing knowledge about healthy eating patterns and suggests improved understanding and increased consistency among the community. Additionally, this indicates that the interactive features in the Obamacare app, such as educational videos and personalized info graphics, can strengthen the digital learning process. This finding supports the study by, which emphasized that user engagement in interactive digital platforms plays a crucial role in improving information retention. Furthermore, also demonstrated that app-based interventions can improve nutrition literacy by up to 30% within four weeks. Other research in the field of obesity has also found that the involvement of healthy, nutritious food consumption is a crucial mediator contained in the application between application design and increased health knowledge, (Niu et al., 2023). More specifically, concluded that delivering information through the 5A's counseling model enhances users' ability to understand the risks of unhealthy diets, particularly among high-risk groups, (Valle, 2010). Another study aligns with previous findings, stating that digital tools can significantly improve nutritional understanding and behavioral changes, (Setyawati & Pramono, 2025).

In line with increased knowledge, public attitudes toward healthy eating also showed a positive trend, from an average of 37.5 before the intervention to 43.4 in the third week. This suggests that this app-based educational approach not only promotes knowledge but also impacts positive attitude changes. These changes reflect the success of the nutrition counseling process influenced by the 5A's model, where attitude formation leads to motivation to act in accordance with acquired knowledge. Additionally, users not only understand the material but also begin to internalize the importance of healthy eating as part of their lifestyle. The application of the 5A's approach, particularly in the Advise and Agree stages, contributes to the formation of personal commitment to behavioral change. Coll-ado- found that 5A-based counseling significantly increased positive attitudes toward balanced diets and physical activity in the adult population. Other research also shows that the structure of the 5A's approach helps



healthcare professionals build more empathetic communication, thereby strengthening individual motivation and risk perception. This is reinforced by the findings of who noted that personalizing educational content based on user needs can shift attitudes from passive to proactive. Furthermore, in a community-based study confirmed that positive attitudes toward balanced nutrition are a strong predictor of long-term behavioral change.

They also reported that community actions related to healthy eating patterns increased significantly from an average of 64.9 before the intervention to 87.5 by the third week. This increase not only reflects positive outcomes but also indicates that individuals are beginning to apply the knowledge and attitudes gained during the counseling process into concrete actions. The improvement in these actions is a key indicator of the success of nutrition counseling, demonstrating that the community responds well to a structured and interactive approach.

Limitation and Implication

The first limitation is that the research sample cannot be selected randomly, specifically for Obamacare app users, as it is implemented in the Banda Aceh and Aceh Besar regions, where practitioners and nutritionists assess the extent to which the app can be used in real-life situations. This initial stage uses the black box Testing method, which emphasizes user interaction with app features without evaluating the internal code. Another limitation relates to the fact that the validity test and questionnaire sample consisted of N46 in Banda Aceh City, Indonesia.

Conclusions

Field findings and evaluation results show that the Obamacare application has high system quality with an average functionality score of 81.2% and ease of use of 87.3%. Through black box Testing and the System Usability Scale (SUS), most features were deemed successful, although minor aspects such as system stability (72.2%) and input validation (70.4%) require improvement. User satisfaction and usage efficiency confirm that the application meets the practical and technical needs of nutritionists in the field.

Using the 5A's model approach, the study showed that the use of the Obamacare application significantly increased knowledge ($\eta^2p= 0.716$), attitude ($\eta^2p= 0.807$), and behavior ($\eta^2p= 0.859$) among the community regarding healthy eating patterns and balanced nutrition. The research findings confirm that structured digital-based interventions (the Obamacare app) can facilitate the process of gradual and sustainable behavioral change among the community, from the awareness stage to concrete actions in daily life related to healthy eating and balanced nutrition for obesity prevention.

These findings will inform future m Health strategies for obesity prevention and nutrition education in resource-limited areas.

Acknowledgements

On this occasion, allow me to express my deepest gratitude, especially to the Poltergeist Ministry of Health campus in Aceh, Indonesia, the Poltergeist hospital, and the Syiah Kuala University campus in Banda Aceh city, Indonesian.

Financing

In this regard, I used my personal funds to cover publication costs and other expenses.



References

- Alessandri, G., Zuffianò, A., & Perinelli, E. (2017). Evaluating intervention programs with a pretest-posttest design: A structural equation modeling approach. *Frontiers in Psychology, 8*(MAR), 1–12. <https://doi.org/10.3389/fpsyg.2017.00223>
- Alunyo, J., Mukunya, D., Napyo, A., Matovu, J., Okia, D., Wanume, B., Okello, F., Tuwa, A., Wenani, D., Okibure, A., Omara, G., & Olupot-Olupot, P. (2024). Factors Associated with Teenage Pregnancies During the Covid-19 Period in Pakwach District, Northern Uganda: A Case-Control Study. *Adolescent Health, Medicine and Therapeutics, Volume 15*, 93–108. <https://doi.org/10.2147/ahmt.s378048>
- Arce-larroy, O. (2025). *Validación del modelo teórico hábitos de vida saludables en el ámbito curricular de Educación Primaria Validation of the theoretical model of healthy lifestyle habits in the Primary Education curriculum Autores Resumen Cómo citar en APA Palabras clave Key. 2025*, 59–74.
- Ariani, D., Dradjat, R. S., Kumboyono, K., & Zuhriyah, L. (2025). A Model for Fostering Self-Efficacy in Breastfeeding Mothers through Self-Directed Learning in Nursing Care. *Malaysian Journal of Nursing, 16*(4), 10–22. <https://doi.org/10.31674/mjn.2025.v16i04.002>
- Arifin, S. R., Tanziha, I., Ekayanti, I., & Ahmad, A. (2025). The impact of a free nutritious meal program on elementary school students' concentration levels. *AcTion: Aceh Nutrition Journal, 10*(3), 790. <https://doi.org/10.30867/action.v10i3.2737>
- Armaita, A., Nisa, S., Lucintarillova, B., Aprihatin, Y., Krishna, N. R., Alimuddin, A., Ockta, Y., Festiawan, R., Soedirman, U. J., & Alimuddin, A. (2025). *Reducing anxiety in pregnant women by prenatal gentle yoga Reducir la ansiedad en mujeres embarazadas a través del yoga prenatal suave Authors How to cite in APA Keywords Resumen Palabras clave. 2025*, 1056–1064.
- Biernat, E., Piątkowska, M., & Mynarski, W. (2018). Prevalence and socioeconomic determinants of leisure time physical activity among Polish farmers. *Annals of Agricultural and Environmental Medicine, 25*(1), 151–156. <https://doi.org/10.26444/aaem/75927>
- Botagariyev, T., Mambetov, N., Aralbayev, A., Mukhanbetaliyev, A., Ispulova, R., & Akhmetov, N. (2024). Web-Based Technologies in Middle School Physical Education. *Retos, 51*, 171–178. <https://doi.org/10.47197/RETOS.V51.100310>
- Brumby, S., Chandrasekara, A., Kremer, P., Torres, S., McCoombe, S., & Lewandowski, P. (2013). The effect of physical activity on psychological distress, cortisol and obesity: Results of the farming fit intervention program. *BMC Public Health, 13*(1). <https://doi.org/10.1186/1471-2458-13-1018>
- Brumby, S., Chandrasekara, A., McCoombe, S., Torres, S., Kremer, P., & Lewandowski, P. (2011). Reducing psychological distress and obesity in Australian farmers by promoting physical activity. *BMC Public Health, 11*. <https://doi.org/10.1186/1471-2458-11-362>
- Camargo, E. M. De, Denise, E., & Bacil, D. A. (2024). *2 (27) = 58,6. 2041*, 332–340.
- Capili, B. (2021). Selection and implementation of outcome measurements. *American Journal of Nursing, 121*(8), 63–67. <https://doi.org/10.1097/01.NAJ.0000767840.30291.31>
- Cristina Valls Bautista. (2023). *97093-Texto del artículo-362422-1-10-2023031. 2041*, 312–326.
- Damschroder, L. J. (2020). Clarity out of chaos: Use of theory in implementation research. *Psychiatry Research, 283*(April 2019). <https://doi.org/10.1016/j.psychres.2019.06.036>
- de Vocht, F., Katikireddi, S. V., McQuire, C., Tilling, K., Hickman, M., & Craig, P. (2021). Conceptualising natural and quasi experiments in public health. *BMC Medical Research Methodology, 21*(1), 1–8. <https://doi.org/10.1186/s12874-021-01224-x>
- Elwy, A. R., Wasan, A. D., Gillman, A. G., Johnston, K. L., Dodds, N., McFarland, C., & Greco, C. M. (2020). Using formative evaluation methods to improve clinical implementation efforts: Description and an example. *Psychiatry Research, 283*(April 2019), 112532. <https://doi.org/10.1016/j.psychres.2019.112532>
- González, J. A. (2025). *Efectos de 8 semanas de entrenamiento flywheel durante la temporada sobre el rendimiento físico en jugadoras de fútbol Effects of 8 weeks in-season flywheel training on physical performance in female soccer players Authors How to cite in APA Keywords Resu. 2025*, 479–490.
- Hamilton, A. B., & Finley, E. P. (2020). Reprint of: Qualitative methods in implementation research: An introduction. *Psychiatry Research, 283*(April 2019), 112629. <https://doi.org/10.1016/j.psychres.2019.112629>
- Korf, M. N., Van Geloven, N., Krijthe, J. H., & Labrecque, J. A. (2025). Causal clarity in statistical software. *International Journal of Epidemiology, 54*(4), 0–5. <https://doi.org/10.1093/ije/dyaf136>

- Kurnia, A., Said, F. M., & Panduragan, S. L. (2025). Experience of Burden in Self-Care of Type 2 Diabetes Mellitus: A Qualitative Study in Indonesian Context. *Malaysian Journal of Nursing*, 16(4), 33–44. <https://doi.org/10.31674/mjn.2025.v16i04.004>
- Kuspanov, N., Botagariyev, T., Ryskaliyev, S., Doshybekov, A., Syzdykov, A., & Gabitov, A. (2024). The influence of information technology on the professional readiness of future trainers in Kazakshakures. *Retos*, 51, 365–372. <https://doi.org/10.47197/RETOS.V51.100350>
- Leão Pereira, A. F., & Lorente-Catalán, E. . (2024). Educación Física de Calidad: Diseño y validación de una herramienta orientada a la reflexión e innovación en los procesos educativos (Quality Physical Education: Design and validation of a tool aimed at reflection and innovation in educational processes). *Retos*, 51, 32-46. <https://doi.org/10.47197/retos.v51.99745>
- Manzano, S. S., de Oliveira, P. B., Magdaleno, A. R., & Ariza, A. R. (2022). Effect of a C-HIIT program in the inhibitory control and behaviour of young ADHD. *Retos*, 45, 878–885. <https://doi.org/10.47197/retos.v45i0.92903>
- Mat, N. H., Musa, R. M., Mat, F., & Zaffri, Z. F. (2025). Identification of essential anthropometric and health-related markers for effective weight loss program in middle-aged women. *Retos*, 65, 1077–1085. <https://doi.org/10.47197/retos.v65.109475>
- Miller, C. J., Smith, S. N., & Pugatch, M. (2020). Experimental and quasi-experimental designs in implementation research. *Psychiatry Research*, 283(June 2019), 112452. <https://doi.org/10.1016/j.psychres.2019.06.027>
- Muharram, N. A. (2025). *Desarrollo de una pulsera de detección de frecuencia cardíaca basada en IoT para el entrenamiento de resistencia en voleibol* Authors Development of IoT-based pulse rate detection bracelet for volleyball endurance training Abstract How to cite in APA Keywo. 2025, 931–940.
- Niu, Z., Iván-Baragaño, I., & Ardá, A. (2023). Análisis multivariante mediante árbol de decisión de los tiros libres indirectos en la Superliga China 2020 (Multivariant decision tree analysis of indirect free kicks in the 2020 Chinese Super League). *Retos*, 48, 358-365. <https://doi.org/10.47197/retos.v48.97650>
- Parada-Flores, B., Faúndez-Casanova, C., Cruz-Hidalgo, N., Díaz-Riquelme, J., Muñoz-Muñoz, F., & Castillo-Retamal, M. (2023). Estilos de vida de adultos en cuarentena total y cuarentena parcial, durante la pandemia por COVID-19 (Lifestyles in adults in total quarantine and partial quarantine, during the COVID-19 pandemic). *Retos*, 48, 494–504. <https://doi.org/10.47197/retos.v48.94282>
- Purnama, H., Ibrahim, M., Juniarni, L., & Lindayani, L. (2025). Evaluating the Impact of a Mobile Application on Mental Health and Help-Seeking Behaviour among Adolescents in Bandung, Indonesia. *Malaysian Journal of Nursing*, 16(April), 1–9. <https://doi.org/10.31674/mjn.2025.v16isupp2.001>
- Rajan, R., Dovbenyuk, R., Kshatriya, M., Yanikomeroğlu, S., Banfield, L., Athale, U., Thabane, L., & Samaan, M. C. (2025). The Impact of Virtual Care on Health-Related Quality of Life in Pediatric Diabetes Mellitus: A Systematic Review. *Adolescent Health, Medicine and Therapeutics, Volume 15*, 109–117. <https://doi.org/10.2147/ahmt.s482859>
- Rosyad, Y. S., Aljaberi, M. A., & Natarajan, S. B. (2025). Strategies for Preventing and Reducing Psychological Problems and Mental Disorders among Deaf and Hearing-Impaired Communities. *Malaysian Journal of Nursing*, 16(4), 314–324. <https://doi.org/10.31674/mjn.2025.v16i04.031>
- Rueda, M., González-Peño, A., Franco, E., & Coterón, J. (2024). Teachers' perceptions of the teaching situation in Physical Education in secondary education: a qualitative study. *Retos*, 51, 912–922. <https://doi.org/10.47197/RETOS.V51.99207>
- Setyawati, H., & Pramono, H. (2025). *Development of a web-based athletic sports learning model in sports talent schools* Desarrollo de un modelo de aprendizaje deportivo basado en la web en escuelas de talentos deportivos Authors How to cite in APA Keywords Resumen Palabras clave. 2025, 1018–1031.
- Siregar, S., Pardilla, H., Hasibuan, N., Fahmi, M., Kasih, I., & Faridah, E. (2025). Enhancing refereeing skills: exploring the influence of an Android table tennis app on student referees. *Retos*, 66, 75–85. <https://doi.org/10.47197/retos.v66.112160>
- Smith, J. D., & Hasan, M. (2020). Quantitative approaches for the evaluation of implementation research studies. *Psychiatry Research*, 283(August 2019), 112521. <https://doi.org/10.1016/j.psychres.2019.112521>
- THE MALAYSIAN JOURNAL OF NURSING VOL. 16(4) April 2025 / i. (2025). 16(April), 2025.



- Turdaliyev, R., Botagariyev, T., Ryskaliyev, S., Doshymbekov, A., & Kissebaev, Z. (2024). Virtual Reality Technology as a Factor to Improve University Sports. *Retos*, 51, 872–880. <https://doi.org/10.47197/retos.v51.101213>
- Valle, F. (2010). Universidad de Valencia. *Universidad de Valencia*, 28(2020), 237–257.
- Yachsie, B. T. P. W. B., Pranata, D., Dewanti, G., Famelia, P., & Kozina, Z. (2024). Validity and reliability of archery sport arm muscle endurance training program based on body weight training. *Retos*, 60, 477–482. <https://doi.org/10.47197/retos.v60.105803>
- Yau, K. W., Tang, T. S., Gorges, M., Pinkney, S., Kim, A. D., Kalia, A., & Amed, S. (2022). Effectiveness of Mobile Apps in Promoting Healthy Behavior Changes and Preventing Obesity in Children: Systematic Review. *JMIR Pediatrics and Parenting*, 5(1), 1–16. <https://doi.org/10.2196/34967>

Authors and translators' details:

Agus Hendra Al Rahmad
Hizir Sofyan
Said Usman
Mudatsir

4605.ah@gmail.com
hizir@usk.ac.id
saidusman@usk.ac.id
mudatsir@usk.ac.id

Author
Corresponding/ Author
Author
Translator