

Digital Nutrition Revolution: The Role of Mobile Apps in Improving Healthy Diet Compliance

Andi Maryam¹, Andi Elis², Siti Jumhati³

Universitas Kurnia Jaya Persada, Indonesia^{1,2}, Universitas Mohammad Husni Thamrin, Indonesia³

e-mail*: andimaryam778@gmail.com

ARTICLE INFO	ABSTRACT
Entered May 02, 2025 Revised May 22, 2025 Accepted May 25, 2025 Published May 26, 2025	The level of compliance with healthy eating patterns in Indonesia is still low even though various campaigns have been carried out, such as the Healthy Living Community Movement (GERMAS). Low nutritional literacy, lack of motivation, and social and cultural influences are the main factors that hinder changes in people's consumption behavior. In this context, mobile applications emerge as a potential solution with interactive features such as food tracking, notifications, and visual education that are personalized and easily accessible. Previous studies have shown that approaches based on behavior change theories, such as Self-Determination Theory and Theory of Planned Behavior, increase the effectiveness of digital interventions in forming healthy eating habits. This study uses a literature review method with a qualitative approach to examine the effectiveness of mobile applications in increasing compliance with healthy eating patterns. Data sources were obtained from national and international journals in the last ten years (2015–2025), which were analyzed using thematic analysis techniques. The results of the study show that the success of the application depends not only on technological features, but also on user-need-based interface design, integration of behavioral theories, and social and professional support. Therefore, digital nutrition applications need to be developed in a multidisciplinary manner to create an inclusive and sustainable impact in community nutrition interventions
Keywords: Diet; Digital Nutrition.Nutrition-App;	

INTRODUCTION

Non-compliance with healthy eating patterns is still a serious challenge in various countries, including Indonesia. Although the government and health institutions have campaigned for the importance of balanced nutrition through various programs, such as the Healthy Living Community Movement (GERMAS), in reality the level of community compliance with nutritional recommendations is still low. A study by Azhari & Fayasari (2020) showed that 95.5% of the Indonesian population still does not consume enough vegetables and fruits according to WHO recommendations, which is a minimum of 400 grams per day. This shows that conventional interventions have not been effective



enough to change people's consumption behavior. One of the main causes is the lack of nutritional literacy and difficulty in accessing relevant and easily understood nutritional information in everyday life.

In addition, individual motivation to adopt a healthy diet is also often hampered by psychosocial factors, such as low risk perception of non-communicable diseases, and high influence of social environment and eating culture. According to research by Sulistyorini & Maesaroh (2019), eating behavior is highly influenced by cognitive and affective factors, including knowledge, beliefs, and emotions towards food. In this context, a more personalized and technology-based approach is an urgent need. Mobile applications with interactive features, such as food consumption tracking, reminder notifications, and visual education, have the potential to be more adaptive tools in bridging the gap between knowledge and practice of healthy eating. Therefore, it is important to further examine how digital technology can provide a more integrated solution in increasing compliance with healthy eating patterns.

Advances in digital technology, especially in the form of mobile applications, have revolutionized approaches to health promotion, including in the field of nutrition. These applications enable personalized and data-driven interventions, which were previously difficult to do with conventional approaches. According to Pala et al. (2024) in the International Journal of Medical Informatics, digital nutrition applications can increase user engagement and self-efficacy in diet management through automatic tracking, gamification features, and real-time feedback. This technology also makes it easy to integrate dietary recommendations based on individual preferences, medical conditions, and health goals of each user, making them more relevant and applicable in everyday life.

However, the effectiveness of mobile applications in improving adherence to healthy eating patterns is highly dependent on the quality of the interface design, the validity of the nutritional data used, and the consistency of users in accessing and utilizing the available features. Without a design strategy based on behavioral change theory, applications will only be complementary tools without long-term impact. Therefore, it is important for application developers and policy makers to not only focus on technical aspects, but also ensure that application content and features are designed based on scientific principles and the real needs of users. This is the main key so that the digital nutrition revolution is truly able to answer the challenge of low adherence to healthy eating patterns in society.

Modern lifestyles characterized by high mobility, busy work patterns, and limited time to plan and prepare healthy meals have created a need for fast, flexible, and personalized nutrition solutions. In this context, mobile applications are present as a relevant tool to answer these challenges. A study by Bégin et al (2022) showed that individuals with busy lifestyles tend to be more responsive to digital-based health interventions because they are considered easier to access anytime and anywhere. The advantages of this application lie in its ability to provide instant information, food consumption reminder features, and automatic analysis of daily calorie and nutritional needs, which indirectly help users make healthier eating decisions in the midst of their busy lives.

However, even though digital nutrition applications provide technical convenience, there are still challenges in ensuring that users not only access the information but also truly internalize and implement it in their daily habits. The level of adoption and sustainability of application use is often influenced by perceived usefulness

and perceived ease of use, as stated by Arrif & Candra (2024). Without an intuitive design and features that are responsive to the real needs of users, applications can easily be abandoned. Therefore, a design approach that prioritizes user experience and support from nutrition professionals in developing its content is crucial so that the application truly functions as a practical and effective solution in forming consistent healthy eating behaviors.

The effectiveness of mobile applications in improving adherence to healthy eating patterns depends not only on the presence of technological features, but also on how far these features can influence user motivation and behavior in a sustainable manner. According to Chazar et al (2025), nutrition applications that combine food tracking features with positive reinforcement such as reminders, daily challenges, and progress visualizations have been shown to be more effective in maintaining user engagement and improving eating patterns than applications that only provide passive information. This shows that an interactive and responsive digital approach is better able to form new habits and foster adherence to recommended nutritional intakes. Therefore, the use of user-centered design is very important in the process of developing health applications in order to create interventions that are not only informative, but also transformative.

However, this effectiveness is not universal and still depends on the socio-cultural context, digital literacy, and psychological factors of the user. In some populations, especially the elderly or communities with limited access to technology, mobile applications still have limitations as a primary intervention tool. Although applications can improve short-term adherence, long-term behavior change requires social support, a multidisciplinary approach, and integration with professional health services. This means that mobile applications should not be positioned as a single solution, but rather as part of a broader intervention ecosystem. Strengthening the synergy between digital technology and conventional approaches is key to creating more inclusive and sustainable eating behavior change.

METHODOLOGY

This study uses a qualitative approach with a literature review study method as the main strategy for data collection and analysis. This approach was chosen to explore in depth various findings, views, and theoretical frameworks related to the effectiveness of mobile applications in increasing adherence to healthy eating patterns. Literature studies were conducted systematically to identify, review, and analyze relevant previous research results, both from national and international journals published in the last ten years (2015–2025).

The literature search process was carried out through leading academic databases such as Google Scholar, Scopus, PubMed, and ScienceDirect using keywords such as: "mobile health application", "digital nutrition", "healthy eating compliance", "behavior change technology", and "mHealth for diet adherence". The selected articles were articles with full-text access, in English or Indonesian, and relevant to the topic and objectives of the study. The data analysis technique used was thematic analysis, namely by grouping literature findings based on main themes such as application effectiveness, psychological and social factors of users, digital intervention design, and implementation challenges. The validity of the analysis results was maintained through a process of source triangulation and peer review of the findings studied, so that a comprehensive and scientifically accountable synthesis of knowledge was obtained.

RESULTS AND DISCUSSION

Digital Transformation in Nutrition Interventions: Opportunities and Challenges

1. Personalization and Accessibility as Key Opportunities in Digital Nutrition Interventions

Mobile apps have been shown to offer significant advantages in delivering more personalized and contextual nutrition information, tailored to users' preferences, health goals, and medical conditions. This customization allows apps to provide more relevant and effective recommendations, increasing user engagement and adherence to dietary recommendations. Sharma & Gaur (2024) suggest that the use of personalization algorithms in nutrition apps significantly increases user engagement levels and helps maintain adherence to recommended diets. By using anthropometric data, apps can provide more precise advice based on individual measurements, such as weight, height, and body composition, which can be measured periodically to assess user progress.

In addition to personalization, the flexibility of access via mobile devices makes nutrition applications very inclusive, especially for productive age groups who often face time constraints and high mobility. This technology offers a practical solution by providing fast and efficient access to nutrition information wherever and whenever needed. Research by Erlina et al. (2025) shows that mobile-based applications are able to improve self-management of health, especially among individuals who are more socially and economically active. By allowing users to monitor daily intake in real-time and receive reminders to form healthy eating habits, this application not only provides information but also provides ongoing support for healthier behavior changes.

The importance of digital-based approaches in nutrition interventions is increasingly evident in the context of public health promotion. With the population increasingly dependent on mobile devices, mobile applications are an ideal tool for creating healthy eating habits among the wider community. For example, Choi et al (2021) revealed that personalized nutrition applications can strengthen adherence to diets, especially if the application is supported by reminder or notification features that remind users of the importance of meeting balanced nutritional intake. This study supports the idea that the success of mobile applications in nutrition interventions is highly dependent on adaptation to individual needs and seamless accessibility.

The combination of personalization and accessibility not only offers more targeted and relevant nutrition solutions, but also opens up opportunities for groups of people who previously may have had difficulty accessing nutrition information conventionally. Thus, the use of mobile applications as part of nutrition interventions can have a wider positive impact, especially in forming healthier and more sustainable eating habits.

2. Digital Literacy Gap and Content Validity as Implementation Challenges

The adoption of technology in the field of nutrition, although providing many conveniences, still faces serious challenges related to the digital literacy gap. Research shows that low digital literacy is associated with difficulties in accessing quality nutritional information. For example, a study by Bertolazzi et al (2024) revealed that groups with low levels of education and older age tend to have difficulty operating digital devices, which leads to a lack of utilization of technology-based applications for health. In this context, the digital literacy gap is not only a technical problem, but also reflects social inequalities that affect the ability to access useful health information.

In addition, various studies have also shown that nutrition apps on the market often do not meet the expected quality standards. A study conducted by Bzikowska et al (2021) found that most nutrition apps available on popular platforms such as the Google Play Store or App Store are not based on solid scientific evidence. Only a few apps follow the standards of health behavior theory and are validated by nutritionists or health professionals. This suggests that without adequate scientific validation, the information provided through these apps can be misleading and risky for users, especially those who rely on the app as their primary source of information.

The validity of app content is becoming increasingly important given the increasing number of apps designed to support changes in people's nutritional behavior. According to research by Eicher-Miller et al. (2021), apps that are based on health behavior theory and have scientific validation can be more effective in changing user behavior than apps that do not have a clear scientific basis. This study emphasizes the need for collaboration between nutritionists, technology developers, and health professionals to ensure that nutrition apps are not only easily accessible but also provide accurate and reliable information.

Overall, higher digital literacy and stricter content validation are needed for nutrition apps to provide maximum benefits. Research by Bejaković & Mrnjavac (2024) also shows that effective digital literacy education can improve individuals' ability to access and utilize technology for health. Therefore, to overcome this challenge, application development based on multidisciplinary collaboration between technology and nutrition science is essential, to ensure that nutrition apps on the market meet relevant scientific standards and are beneficial to public health.

Effectiveness of Mobile Applications on Healthy Diet Compliance: An Empirical and Theoretical Review

1. The Role of Behavior Change Theory in Increasing the Effectiveness of Nutrition Applications

In today's digital era, the use of mobile applications as a means of health intervention is increasingly widespread, including in promoting healthy eating habits. However, the effectiveness of these applications is highly dependent on the underlying theoretical approach. Research by Maulidiyanti et al (2024) shows that mobile applications developed based on behavioral change theories, such as Self-Determination Theory (SDT) and Theory of Planned Behavior (TPB), are significantly more effective in forming healthy eating habits compared to applications that only present educational information passively. Applications based on this theory have been shown to be more capable of motivating users in the long term because they consider various psychological aspects that influence behavioral change, such as autonomy, competence, and social connectedness.

In the context of SDT, individuals tend to be more motivated when they feel that the behavior they are performing is the result of personal choice and not external pressure. Intrinsic motivation increases when the three basic psychological needs of autonomy, competence, and relatedness are met. Nutrition apps designed based on SDT typically provide flexibility in setting goals, provide positive feedback on user progress, and include interactive features that encourage social engagement. With this approach, users feel more empowered and in control of their lifestyle changes, thereby increasing adherence to the dietary intervention being implemented (Fauziah et al., 2023).

Meanwhile, TPB emphasizes that behavior change is influenced by intention, which is formed from attitudes toward the behavior, subjective norms, and perceived behavioral control. Apps that integrate TPB principles can help shape positive attitudes toward healthy eating by providing evidence-based information, reinforcing social norms through community features or group support, and increasing users' perceptions of their ability to control food intake through daily goal setting, smart reminders, and progress tracking.

This finding is also supported by a study by Maulidiyanti et al (2024) which states that applications that implement behavior change techniques (BCTs) such as self-monitoring, goal setting, and feedback on behavior are more effective in facilitating changes in health behavior. In the context of nutrition applications, the application of these techniques is very important to guide users systematically and sustainably towards healthier eating patterns.

Thus, the integration of psychological theory in the design of nutrition mobile applications not only increases user engagement but also strengthens the motivational and cognitive aspects needed to support long-term behavior change. This shows that the success of digital interventions in forming healthy eating patterns is not enough to rely on educational information alone, but must be accompanied by a theory-based approach that considers the complexity of human behavior. This scientific approach is an important foundation for the development of more effective and sustainable nutrition-based digital interventions.

2. Interactivity and Gamification as Determinants of User Engagement and Compliance

Interactivity and gamification have been shown to play an important role in increasing user engagement and adherence to health apps, especially those related to dietary changes. Features such as daily food consumption tracking, automatic reminders, weekly challenges, and progress visualization not only make self-monitoring easier but also create a more dynamic and personalized user experience. This interactive experience triggers deeper emotional and cognitive engagement, thus encouraging users to be more consistent in carrying out healthy behaviors. In addition, the integration of gamification elements such as point systems, virtual rewards, and tiered achievements can generate a sense of achievement and encourage users' intrinsic motivation. This is in line with the Self-Determination Theory (Deci & Ryan, 1985) in Mandowa (2022), which states that intrinsic motivation can grow if three basic psychological needs are met, namely autonomy, competence, and relatedness. Gamification features support these three aspects by providing freedom in determining targets, providing feedback on success, and creating a community of users who are connected to each other in weekly challenges.

Scientific support for the importance of interactivity is also found in the theory of self-efficacy by Islam et al (2023), which explains that a person's confidence in their ability to achieve goals increases when they can actively monitor progress. Visualization of progress and food consumption records allow users to see their progress in real-time, which in turn strengthens self-confidence and the drive to continue healthy behaviors (Berger & Jung, 2024). Additionally, the Behavioral Activation Model suggests that engaging in activities that provide positive feedback can reinforce new habits. In the context of the app, weekly challenges and virtual rewards serve as forms of positive feedback that consistently reinforce healthy behaviors.

Empirical research conducted by Widartika (2025) also strengthens this argument, where it was found that applications with interactive features are much more effective in forming healthy eating habits than applications that only present information statically. This finding is also supported by the principles in the Behavioral Design Framework by Fogg (2003), which emphasizes the importance of three elements to change behavior, namely motivation, ability, and triggers. Applications that combine gamification and interactivity features directly meet all three elements: increasing motivation through rewards, strengthening ability by providing easy tracking tools, and providing triggers in the form of periodic reminders or challenges.

Considering all the above theories and scientific findings, it is clear that health app design should not only be informative, but also prioritize interactivity and gamification elements to create a fun, motivating, and sustainable experience. Such an approach can strengthen user engagement in the long term, as well as increase the level of adherence to healthy eating behaviors, which is the main goal of app-based digital interventions

CONCLUSION

Digital transformation in nutrition interventions opens up huge opportunities through the personalization and accessibility offered by mobile applications. Personalization based on individual data allows for more relevant and effective nutrition recommendations, while flexibility of access makes these applications inclusive, especially for productive age groups with limited time. The integration of behavioral change theories such as Self-Determination Theory and Theory of Planned Behavior, as well as the application of interactivity and gamification, has been shown to significantly increase user engagement and adherence to healthy eating patterns. However, this transformation also faces serious challenges, especially the digital literacy gap that can limit the use of technology by certain groups, as well as the issue of content validity that does not yet fully meet scientific standards. Therefore, the development of digital nutrition applications needs to be carried out in a multidisciplinary manner and based on scientific evidence in order to be able to provide a broad, sustainable, and reliable positive impact in improving the nutritional health of the community

LITERATURE

- Arrif, R. A., & Candra, Y. (2024). PENGARUH E-TRUST, E-SATISFACTION, PERCEIVED EASE OF USE, PERCEIVED USEFULNESS, DAN PERCEIVED ENJOYMENT TERHADAP CONTINUANCE INTENTION E-WALLET DI KOTA MAKASSAR. *Study Of Scientific And Behavioral Management (SSBM)*, 5(4), 83-95.
- Azhari, M. A., & Fayasari, A. (2020). Pengaruh Edukasi Gizi Dengan Media Ceramah Dan Video Animasi Terhadap Pengetahuan Sikap Dan Perilaku Sarapan Serta Konsumsi Sayur Buah. *Action: Aceh Nutrition Journal*, 5(1), 55-61.
- Bégin, C., Berthod, J., Martinez, L. Z., & Truchon, M. (2022). Use Of Mobile Apps And Online Programs Of Mindfulness And Self-Compassion Training In Workers: A Scoping Review. *Journal Of Technology In Behavioral Science*, 7(4), 477-515.
- Bejaković, P., & Mrnjavac, Ž. (2024). The Characteristics And Role Of Digital Literacy In An Effective Health Protection. *Heliyon*, 10(8).
- Berger, M., & Jung, C. (2024). Gamification Preferences In Nutrition Apps: Toward Healthier Diets And Food Choices. *Digital Health*, 10, 20552076241260482.

- Bertolazzi, A., Quaglia, V., & Bongelli, R. (2024). Barriers And Facilitators To Health Technology Adoption By Older Adults With Chronic Diseases: An Integrative Systematic Review. *BMC Public Health*, 24(1), 506.
- Bzikowska-Jura, A., Sobieraj, P., & Raciborski, F. (2021). Low Comparability Of Nutrition-Related Mobile Apps Against The Polish Reference Method—A Validity Study. *Nutrients*, 13(8), 2868.
- Chazar, C., Fahrizal, M., Ramadhan, Y., Nugraha, M., Akmal, T., & Henryka, S. I. (2025). PENGEMBANGAN DAN PENERAPAN APLIKASI NUTRI-GRADE DI PUSKESMAS CIMARAGAS UNTUK Mendukung Edukasi Dan Pemantauan Gizi Masyarakat. *J-ABDI: Jurnal Pengabdian Kepada Masyarakat*, 4(9), 1863-1868.
- Choi, J., Chung, C., & Woo, H. (2021). Diet-Related Mobile Apps To Promote Healthy Eating And Proper Nutrition: A Content Analysis And Quality Assessment. *International Journal Of Environmental Research And Public Health*, 18(7), 3496.
- Eicher-Miller, H. A., Prapkee, L., & Palacios, C. (2021). Expanding The Capabilities Of Nutrition Research And Health Promotion Through Mobile-Based Applications. *Advances In Nutrition*, 12(3), 1032-1041.
- Erlina, L., Putri, D. S. K., Waluya, N. A., & Hamzah, A. (2025). PENGGUNAAN APLIKASI LE-DIABET DALAM PENGELOLAAN DIABETES MELITUS: STUDI KESIAPAN DENGAN TECHNOLOGY ACCEPTANCE MODEL. *Media Penelitian Dan Pengembangan Kesehatan*, 35(1), 326-337.
- Fauziah, S., Surmita, S., Priawantiputri, W., Mutiyani, M., Mahmudah, U., & Mulyo, G. (2023). Efektivitas Pendidikan Gizi Dengan Aplikasi Berbasis Android Terhadap Pengetahuan Serta Konsumsi Sayur Dan Buah Remaja. *Jurnal Gizi Dan Dietetik*, 2(1), 13-24.
- Islam, K. F., Awal, A., Mazumder, H., Munni, U. R., Majumder, K., Afroz, K., ... & Hossain, M. M. (2023). Social Cognitive Theory-Based Health Promotion In Primary Care Practice: A Scoping Review. *Heliyon*, 9(4).
- Mandowa, R. (2022). INTERVENSI MOBILE APPLICATION TERHADAP PENINGKATKAN LITERASI NUTRISI IBU DENGAN ANAK STUNTING: A SYSTEMATIC REVIEW= MOBILE APPLICATION INTERVENTION ON IMPROVING NUTRITIONAL LITERATURE OF MOTHERS WITH STUNTING CHILDREN: A SYSTEMATIC REVIEW (Doctoral Dissertation, Universitas Hasanuddin).
- Maulidiyanti, M., Hawadi, L. F., & Anshari, D. (2024). Efektivitas Komunikasi Perubahan Sosial Dan Perilaku Dalam Peningkatan Pengetahuan Gizi Remaja: Scoping Review. *Jurnal Kesehatan Vokasional*, 9(4), 286-300.
- Pala, D., Petrini, G., Bosoni, P., Larizza, C., Quaglini, S., & Lanzola, G. (2024). Smartphone Applications For Nutrition Support: A Systematic Review Of The Target Outcomes And Main Functionalities. *International Journal Of Medical Informatics*, 184, 105351.
- Sharma, S. K., & Gaur, S. (2024). Optimizing Nutritional Outcomes: The Role Of AI In Personalized Diet Planning. *Int. J. Res. Publ. Semin*, 15, 107-116.
- Sulistiyorini, E., & Maesaroh, S. (2019). Hubungan Pengetahuan Dan Sikap Remaja Putri Tentang Anemia Dengan Perilaku Mengonsumsi Tablet Zat Besi Di Rw 12 Genengan Mojosongo Jebres Surakarta. *Jurnal Kebidanan Indonesia*, 10(2), 110-121.

Widartika, S. K. M. (2025). Strategi Pendidikan Gizi Kuliner (Culinary Nutrition Education) Berbasis Praktik: Pendekatan Teori Dan Aplikasi. Book Chapter Of Culinary Nutrition..