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Trust, stigma reduction, and quality of life in obesity mHealth adoption

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ABSTRACT

The rapid growth of mobile health (mHealth) technologies has transformed obesity management in emerging markets, including Indonesia, where rising obesity prevalence coincides with high smartphone penetration. Despite the increasing availability of digital obesity care applications, limited research has examined adoption from a consumer decision-making perspective. This study investigates how Digital Self-Management Capability and Perceived Ethical Digital Health Marketing influence Adoption and Continuance Intention of obesity mHealth services, through the mediating roles of Quality of Life Improvement and Consumer Trust, as well as the impact of Obesity Stigma Reduction. Using a quantitative cross-sectional survey design, data were collected from 379 Indonesian adults with overweight or obesity who had experience using digital obesity management applications. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that Digital Self-Management Capability significantly enhances Quality of Life Improvement, strengthens Consumer Trust, and substantially reduces perceived Obesity Stigma. Perceived Ethical Digital Health Marketing significantly improves Quality of Life and Consumer Trust, but does not directly reduce stigma. Furthermore, Quality of Life Improvement, Consumer Trust, and Obesity Stigma Reduction all significantly influence Adoption and Continuance Intention, with Consumer Trust emerging as the strongest predictor. The study contributes theoretically by integrating motivational, relational, and psychosocial mechanisms into a value-based consumer adoption model for digital obesity care. In practice, the findings highlight that the sustainable adoption of obesity mHealth services in Indonesia depends not only on technological functionality but also on building trust, reducing stigma, and delivering meaningful improvements in users' quality of life.

Keywords: Digital self-management capability; Consumer trust; Obesity stigma reduction; Quality of life improvement; mHealth adoption.

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INTRODUCTION

Obesity is a major global public health issue driven by unhealthy diets, physical inactivity, and environmental factors. Its prevalence has increased at an alarming rate worldwide, with more than one billion people living with obesity in 2022. This figure has more than doubled among adults and quadrupled among children and adolescents

since 1990 (Lobstein, 2015; Spătărelu & Popa, 2021). Globally, the combined prevalence of overweight and obesity reached approximately 38% in 2023 and is projected to exceed 50% by 2035, particularly in low- and middle-income countries, surpassing the World Health Organization's targets to halt further growth (Dissen et al., 2025). Beyond its clinical consequences, obesity imposes multidimensional impacts, including increased risks of chronic diseases, mental health problems, escalating healthcare utilization, and substantial economic and productivity losses (Biener et al., 2023; Lehnert et al., 2013).

Indonesia reflects these global trends within a rapidly evolving socio-economic context. The prevalence of overweight and obesity among Indonesian adults has steadily increased over the past three decades, reaching approximately 21–22% in 2023 (Rifqi et al., 2025). At the same time, the country has experienced widespread smartphone adoption, with penetration rates exceeding 90%, fundamentally reshaping how individuals access and engage with health-related information and services (DataReportal, 2024; GSMA, 2023). This digital transformation has created new opportunities for scalable and accessible health interventions.

In response to the growing complexity of obesity as a lifestyle-related condition, digital health and mobile health (mHealth) technologies have emerged as important tools for prevention and management. mHealth refers to the use of mobile devices, applications, and wireless technologies to support health services and information delivery (WHO, 2011; Free et al., 2013). These technologies enable scalable, continuous, and personalized interventions that extend beyond traditional clinic-based care (Hinchliffe et al., 2022; Ramalho et al., 2015). mHealth solutions typically integrate several key features. First, self-monitoring tools allow users to track dietary intake, physical activity, and weight-related behaviors, enhancing awareness and self-regulation (Arshad et al., 2025). Second, digital nutrition education provides accessible information that supports informed dietary choices and long-term habit formation (Chiavarini et al., 2025). Third, personalized coaching and telemedicine services offer tailored guidance and professional support, improving adherence and continuity of care (Ahola et al., 2024; Shariq et al., 2024). These features collectively contribute to improved health outcomes. Accumulating evidence shows that digital interventions are associated with reductions in body mass index (BMI), improved dietary patterns, and increased physical activity levels across diverse populations (Bertoli et al., 2025; Grady et al., 2023).

Obesity is also a highly sensitive and stigmatized condition that affects not only physical health but also psychological well-being and social experiences. Individuals living with obesity often face negative stereotypes, discrimination, and social exclusion, including within healthcare settings (Bannuru et al., 2025; Naumova et al., 2024). These experiences may discourage care-seeking behaviors and hinder long-term health management. While digital health solutions offer increased accessibility and personalization, they also introduce new concerns related to data privacy, credibility of health claims, and ethical marketing practices, all of which are critical for building consumer trust (İşikay, 2021; Salahuddin et al., 2025). Moreover, although quality of life is commonly assessed as a clinical outcome of digital health interventions, its role as a mechanism that shapes consumer value and influences behavioral decisions remains underexplored (Kandeel et al., 2024).

The literature on digital interventions for obesity has expanded rapidly over the past decade; however, it remains largely anchored in a biomedical and intervention-centric perspective (Bardus et al., 2016; Direito et al., 2017). Most empirical studies prioritize clinical effectiveness, focusing on measurable improvements in anthropometric and physiological indicators such as BMI, waist circumference, and cardiometabolic risk factors (Flølo et al., 2025; Nisa & Barsbay, 2022). In addition, medical and behavioral outcomes—such as physical activity, dietary adherence, and treatment compliance—are commonly used as primary endpoints (Frattolillo et al., 2025; Koo et al., 2025). While these studies provide important evidence of effectiveness, they predominantly position individuals as clinical subjects rather than as consumers making adoption decisions. A parallel stream of research focuses on intervention design, emphasizing multicomponent systems that integrate mobile applications, wearable devices, telehealth, and AI-driven personalization (Foley et al., 2016; Bennett et al., 2018). Other studies examine adoption factors, highlighting the importance of perceived usefulness, ease of use, digital literacy, and institutional trust (Mouloudj et al., 2023; Tran & Khoa, 2025; Taylor et al., 2022). However, existing research places greater emphasis on clinical effectiveness and short-term medical outcomes, while the mechanisms of perceived value from a consumer perspective remain underexplored (Zhang et al., 2019; Perski et al., 2017). Furthermore, trust in digital health services, stigma-related barriers, and quality of life as a value driver are rarely integrated into a comprehensive adoption framework.

Despite the growing body of research, significant gaps remain. First, the decision-making processes underlying the adoption and continued use of obesity-related mHealth services are still poorly understood. Second, trust in applications, service providers, and data governance has not been sufficiently incorporated into existing models, despite its critical role in digital health adoption. Third, psychosocial factors such as obesity stigma are often overlooked, even though they may hinder user engagement. Finally, quality of life is typically treated as a clinical outcome rather than as a determinant of perceived value and behavioral intention. This study aims to understand how digital self-management capabilities and ethical digital health marketing practices influence consumers' decisions to adopt and continue using obesity mHealth services in Indonesia. Specifically, this study examines the mediating roles of consumer trust, stigma reduction, and quality of life in shaping adoption and continuance intention.

Theoretically, this study contributes by integrating perspectives from digital health and business management through a value-based approach, extending existing mHealth adoption models beyond purely utilitarian and clinical considerations. Practically, the findings provide strategic insights for app developers, digital health providers, and policymakers to design obesity management solutions that are not only clinically effective but also capable of building trust, reducing stigma, and enhancing users' quality of life.

LITERATURE REVIEWS

M-Health Services and Digital Obesity Care in Emerging Markets

Mobile health (m-Health) services have emerged as a strategic solution to address the growing burden of obesity in emerging markets, where rapid urbanization and lifestyle transitions have intensified diet-related health risks. m-Health refers to the use of mobile applications and digital tools to support health monitoring, education, and intervention, offering scalable and cost-effective alternatives to conventional healthcare systems (Silva et al., 2015). In the context of obesity care, digital solutions typically integrate self-monitoring of weight, dietary intake, physical activity, and remote professional consultations, which have demonstrated effectiveness across low- and middle-income countries (Sharma et al., 2024).

The global expansion of m-Health is particularly pronounced in the Asia-Pacific region, driven by high smartphone penetration and increasing prevalence of chronic conditions such as obesity (Metzendorf et al., 2024). Digital obesity care applications often adopt multicomponent approaches involving behavioral tracking, feedback mechanisms, and parental or professional engagement, which have been shown to reduce body mass index and improve physical activity, especially among children and adolescents (Palozzi & Antonucci, 2022).

In emerging markets such as Indonesia, India, and China, m-Health initiatives are increasingly aligned with national public health programs to enhance accessibility and preventive care (M. Chen & Peng, 2022; Sezgin, 2021). However, challenges related to infrastructure reliability, digital literacy, and long-term user engagement remain critical considerations for sustainable implementation (Mensah et al., 2022). Despite these barriers, m-Health services continue to have substantial potential to expand equitable access to obesity care in resource-constrained settings.

Integrated Underpinning Theory

This study is grounded in a multi-theoretical framework that integrates Self-Determination Theory (SDT), Trust Theory, and Stigma Theory to explain consumer adoption and continuance intention toward digital obesity mHealth services. Self-Determination Theory posits that sustained health-related behaviors are driven by intrinsic motivation, which emerges when individuals experience autonomy, competence, and psychological well-being (Deci & Ryan, 2012; Ryan & Deci, 2000). In the context of digital obesity care, digital self-management capability enables users to monitor actively and regulate their health behaviors, thereby enhancing perceived competence and autonomy. Improvements in quality of life further reinforce autonomous motivation, supporting continued engagement with mHealth services (Michalovic et al., 2019).

To complement the motivational perspective, Trust Theory offers a relational lens for explaining how users evaluate and accept digital health platforms. Trust is particularly critical in digital healthcare environments characterized by information asymmetry, perceived risk, and sensitive personal data (Goren et al., 2022; Miroso & Mangan-Walker, 2018). Ethical digital health marketing practices—such as transparency, data responsibility, and non-exploitative communication—play a central role in fostering consumer trust, which in turn facilitates both adoption and continued use of mHealth services.

Additionally, Stigma Theory offers a social-psychological foundation for understanding obesity-related barriers to healthcare engagement. Obesity stigma has been shown to negatively affect self-esteem, help-seeking behavior, and willingness to engage with health interventions (Andreassen et al., 2022; Puhl et al., 2017). Digital obesity care can mitigate these effects by providing private, non-judgmental environments, thereby reducing perceived stigma and enhancing psychological safety. Collectively, these theories provide a comprehensive framework to explain how motivational, relational, and social mechanisms shape consumer decisions in digital obesity care.

Hypothesis Development

Digital Self-Management Capability (DSMC) refers to individuals' ability to actively manage obesity-related conditions using digital technologies, particularly mobile applications and digital therapeutics. This concept reflects behavioral and cognitive capabilities supported by key digital features, including self-monitoring, personalized feedback, nutrition education, and coaching and clinical integration. The literature confirms that DSMC is not just the use of technology, but reflects the level of empowerment of users in controlling, understanding, and modifying health behaviors in a sustainable manner (McAllister et al., 2016; Patel et al., 2021). Self-monitoring allows individuals to monitor their weight, calorie intake, and physical activity in real-time, which has been shown to improve self-awareness and consistency of healthy behaviors (Berry et al., 2021). Personalized feedback and digital therapeutics strengthen this capability by providing personalized data-driven adaptive

recommendations, thereby increasing user relevance and engagement (Lautenbach et al., 2025; Lee & Youm, 2025). Meanwhile, clinically integrated nutrition education and coaching expand the role of DSMC from mere self-supervision to a holistic support system that is aligned with formal health services (Kearns et al., 2025).

DSMC conceptually contributes to improving quality of life (QoL) by enhancing physical, psychological, and social functioning. Empirical studies show that digital self-management not only impacts weight loss but also affects psychological well-being, self-efficacy, and self-control (Aukan et al., 2025; Bertoli et al., 2025). By providing a sense of control and autonomy, DSMC helps individuals reduce distress due to obesity and improve their perception of overall quality of life (Palmeira et al., 2016).

Consumer trust is a key determinant of mHealth service adoption, especially for sensitive health conditions such as obesity. DSMC contributes to consumer trust through data transparency, system reliability, and perceived usability of technology. Research on chronic disease self-management shows that consistent, personalized, and easy-to-use digital systems increase user trust in technology and service providers (Dadgar & Nickel, 2025; Hui et al., 2021). In addition, personalized feedback features and clinical integration reinforce the perception of legitimacy and security, which are the foundation of trust in the mHealth ecosystem (El-Annan & Hassoun, 2024). Obesity stigma is a significant obstacle in the search for and sustainability of treatment. DSMC has the potential to reduce stigma, especially internalized weight stigma, by providing a private, non-judgmental, and empowerment-based space for weight management (Kearns et al., 2025). Digital self-management improves self-efficacy and self-compassion, which have been shown to suppress the internalization of stigma and improve mental health (Hilbert et al., 2015; O'Shea et al., 2024). By shifting the focus from individual faults to data-driven management processes and support, DSMC helps reconstruct the obesity experience in a more positive light.

Based on the literature and empirical evidence of existing studies, this study formulates the following hypothesis:

H1: Digital Self-Management Capability has a positive effect on Quality of Life Improvement of obesity mHealth service users in Indonesia

H2: Digital Self-Management Capability has a positive effect on Consumer Trust in obesity-related mHealth services in Indonesia

H3: Digital Self-Management Capability has a negative effect on Obesity Stigma, thereby reducing the level of stigma experienced by users of obesity mHealth services in Indonesia

Perceived Ethical Digital Health Marketing (PEDHM) refers to the extent to which consumers view healthcare digital marketing practices as ethical, transparent, fair, and respectful of user autonomy, especially in health data management, benefit-risk communication, and user representation. In the context of digital health, ethical perceptions not only serve as a reputational mechanism but also as a signal of the quality and moral legitimacy of health services (Mujollari et al., 2025). A case study on the online marketing sector in Albania shows that high standards of digital ethics significantly increase consumers' positive perception of products and service providers, especially in high-involvement industries such as healthcare. PEDHM comprises several main dimensions: data use transparency, privacy protection, fair access, informed consent, and non-stigmatizing, evidence-based communication narratives (Wykes et al., 2019; Yuguero et al., 2025). In the context of digital health, failure to meet these principles can undermine trust, reinforce inequality, and even exacerbate stigma against vulnerable groups, including individuals with obesity (Brall et al., 2019; Marckmann, 2020).

PEDHM contributes to improving quality of life (QoL) by increasing user engagement, compliance, and a sense of security when using digital health services. Ethically perceived digital interventions encourage active participation and sustainability of use, which ultimately positively impacts physical and psychological well-being (R. Guo et al., 2025). Case studies on digital pharmaceutical interventions for ischemic heart disease patients show that a patient-oriented and transparent digital approach significantly improves health-related quality of life (Khan et al., 2025).

Consumer trust is the most direct outcome of PEDHM. Cross-sector literature consistently shows that data transparency, honesty of health claims, and ethical AI governance strengthen consumer trust, particularly in sensitive data-driven services (El-Annan & Hassoun, 2024; O'Higgins & Fatorachian, 2025). Mujollari et al.'s (2025) study on digital marketing shows that ethical practices serve as integrity signals that mediate adoption intent and loyalty. In the context of digital health, initiatives such as the ethicovigilance platform in France show how ethical oversight increases public trust in the digital health ecosystem (Cherchem et al., 2025).

PEDHM also plays a strategic role in reducing obesity stigma through how digital health services frame obesity. Health campaigns that simplify obesity as individual failures have been shown to reinforce stigma and user resistance (Varshney, 2021). In contrast, ethical digital marketing emphasizes the biological and social complexities of obesity, as well as using positive and inclusive representations, to lower stigma and negative physiological responses to individuals with obesity (Oliver et al., 2017). An ethical study on obesity apps in Germany confirms that stigma-sensitive design and communication are key ethical prerequisites in digital obesity care (Zheng et al., 2025).

Based on the literature and empirical evidence of existing studies, this study formulates the following hypothesis:

H4: Perceived Ethical Digital Health Marketing has a positive effect on the Quality of Life Improvement of

mHealth obesity service users in Indonesia

H5: Perceived Ethical Digital Health Marketing has a positive effect on Consumer Trust in obesity services mHealth.di Indonesia

H6: Perceived Ethical Digital Health Marketing has a negative effect on Obesity Stigma, thereby reducing the stigma experienced by users of obesity mHealth services.

Quality of Life Improvement (QoLI) is a multidimensional outcome encompassing physical, psychological, and social well-being and has long been an indicator of the success of health interventions. Increasing QoL in health is carried out through various interventions, ranging from mindfulness-based interventions (Aghaie et al., 2018), Exercise and nutrition programs (Emerson et al., 2017), Health Technology (Victoria-Castro et al., 2024) to yoga for medical students (Chauhan et al., 2025) —consistently improve QoL through improvements in mental health, emotion regulation, and social functioning. Conceptually, QoLI acts as a perceived value outcome that drives the adoption of health technology. The mHealth adoption literature shows that the perception of real benefits to a user's life increases initial intention to use the service (Alam et al., 2022). Empirical studies on chronic disease management mHealth services show that increased QoL strengthens perceived usefulness and user satisfaction, which are the main determinants of adoption intention (Akter, D'Ambra, et al., 2013; Y. Chen et al., 2024). QoLI also plays a central role in continuance intention, as users tend to maintain using services that have a real impact on their well-being. Wang et al. (2022), through a meta-analysis of various mHealth services, found that perceived health-related quality of life had a significant effect on continuance intention (Wang et al., 2022). RCT case study in thyroid cancer patients (Sun et al., 2024) and the elderly community (Wong et al., 2022) shows that mHealth, which significantly improves QoL, encourages sustainable use.

H7: Quality of Life Improvement has a positive effect on Adoption & Continuance Intention in obesity mHealth and general mHealth services.

Consumer trust reflects users' belief that mHealth service providers are competent, have integrity, and demonstrate goodwill in managing sensitive health services and data. In the context of digital services that have minimal face-to-face interaction, trust is a replacement mechanism for physical and institutional guarantees (Pennanen & Paakki, 2006). The digital marketing literature confirms that information transparency, data security, and service provider reputation are the main foundations of building consumer trust (AlDiri et al., 2010; Mohanty et al., 2025). In the health sector, trust is increasingly crucial due to the high perceived risk. Cross-contextual studies show that credible digital interactions—including reliable communication and ethical representation—significantly increase consumer trust and user behavioral intent (Bhattacharya et al., 2025; Yee et al., 2025). In mHealth, trust is also dynamic and can be formed through the trust transfer mechanism from offline health services to digital platforms (Meng et al., 2019).

Conceptually, consumer trust is a key determinant of adoption intention because it reduces uncertainty and perceived technological risks. Empirical study of mHealth services in China shows that trust mediates the relationship between service quality and adoption intention (Li et al., 2022). Similar findings are shown by Deng et al. (2018), who assert that trust significantly increases adoption intent, while privacy and performance risk weaken it (Deng et al., 2018). In addition, studies of young users (Rai & Srivastava, 2025) show that socio-technical factors that build trust directly drive adoption of the mHealth application. Consumer trust also plays a strategic role in continuance intention, especially in digital health services that require long-term use. Classical studies show that trust mediates the relationship between trustworthiness and continuance intention in mHealth services, including in the context of the bottom of the pyramid (Akter, Ray, et al., 2013). A follow-up study by Meng et al. (2022) on elderly users showed that both cognitive trust and affective trust significantly increased continuance intention, with the role of health moderation and technology anxiety (Meng et al., 2022).

H8: Consumer Trust has a positive effect on Adoption & Continuance Intention in both obesity mHealth and general mHealth services.

Obesity stigma refers to stereotypes, prejudices, and discriminatory treatment of individuals with obesity, which have been shown to negatively impact mental health, health behaviors, and health service utilization (Pearl, 2018; Westbury et al., 2023). This stigma not only appears in the social space, but is also internalized (internalized weight stigma), thus encouraging avoidance of health services and decreasing adherence to medical interventions (Hilbert & Puls, 2018; Pearl & Sheynblyum, 2025). Obesity stigma reduction (OSR) efforts focus on cognitive, affective, and structural changes, including obesity biogenetic education (Hilbert, 2016), dissonance intervention cognitive (Ciao & Latner, 2011), and non-stigmatized communication in clinical practice (Moizé et al., 2025). In the digital context, mHealth offers a more private, personal, and non-judgmental space, thus potentially lowering stigma and psychological barriers in seeking treatment (Kearns et al., 2025).

Conceptually, reducing the stigma of obesity lowers the emotional and social barriers that have prevented

individuals from accessing health services. IMI2 SOPHIA qualitative study in Europe shows that experiences of stigma cause individuals with obesity to delay or avoid formal health services (Hollmann et al., 2024). By reducing stigma through supportive language and framing obesity as a chronic disease, services—including mHealth—become more acceptable (Albury et al., 2020). OSR also plays an important role in continuance intention, as ongoing stigma can damage users' relationships with healthcare services and reduce long-term engagement. Studies show that weight bias in healthcare correlates with low quality of care and patient adherence (Phelan et al., 2015). Instead, interventions that reduce stigma—such as the STEREOBES patient education program (Ramsamy et al., 2024)—aims to improve self-efficacy and quality of life, which are important predictors of continuous service use. In the context of obesity mHealth, a decrease in stigma reinforces a sense of safety and user engagement, thereby encouraging long-term use.

H9: Obesity Stigma Reduction has a positive effect on adoption and continuance intention in obesity mHealth and general mHealth services.

The nine hypotheses developed in this study are further summarized in the research model shown in Figure 1.

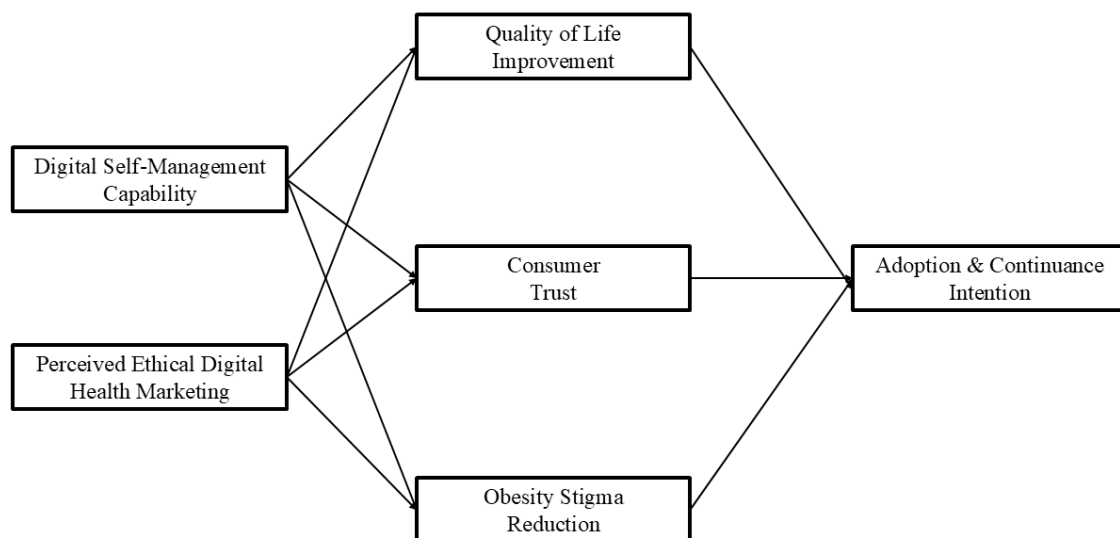


FIGURE 1. Research Model

METHODS

This study employs a quantitative explanatory research approach using a cross-sectional survey design, with the individual consumer as the unit of analysis. The research focuses on understanding consumer decision-making in the adoption and continued use of digital obesity management services in Indonesia. Specifically, the study examines the causal effects of digital self-management capability and perceived ethical digital health marketing on adoption and continuance intention, while considering the mediating roles of quality-of-life improvement and consumer trust, and the moderating effect of perceived reduction in obesity-related stigma.

Data were collected using a structured self-administered questionnaire, developed based on established measurement scales from prior studies in digital health, self-management, ethical health marketing, trust, quality of life, and obesity stigma. All measurement items were adapted to the context of digital obesity management services and assessed using a five-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The questionnaire comprised several constructs, including digital self-management capability, measured using 10 indicators reflecting self-monitoring behaviors (e.g., calorie intake, body weight, and physical activity), personalized feedback, and digital nutrition education and behavioral guidance (Bulaj et al., 2016; Fortuna et al., 2022; W. Guo et al., 2026; Patel et al., 2021; Singh et al., 2025); perceived ethical digital health marketing, measured using 10 indicators capturing transparency of health-related claims, non-stigmatizing and inclusive communication, privacy and data protection signaling, and perceptions of responsible AI use and clinical credibility (Arshanapally et al., 2022; Dunlop et al., 2016; Hashimoto et al., 2024; Liu et al., 2023); quality of life improvement, operationalized as a consumer value driver rather than a purely clinical outcome, and measured using 8 indicators encompassing physical well-being, psychological well-being, and daily functioning and self-confidence (Akter, D’Ambra, et al., 2013; Alam et al., 2022; Kandeel et al., 2024); and consumer trust in digital

health services, measured using 6 indicators reflecting trust in the technology, the service provider, and expected health outcomes (Akter et al., 2011; Guckert et al., 2022; Rai & Srivastava, 2025; Raza et al., 2025).

Perceived obesity-related stigma reduction was included as a moderating variable and measured using 9 indicators assessing the extent to which digital obesity services are perceived to reduce feelings of shame and blame, avoid judgmental or blame-oriented language, provide a psychologically safe and respectful environment, encourage self-acceptance and dignity, minimize social comparison and labeling, protect user anonymity and confidentiality, normalize obesity as a health condition rather than a moral failure, promote empowerment rather than surveillance, and enhance comfort in engaging with weight-management content (O'Shea et al., 2024; Puhl et al., 2017). The dependent variable, adoption and continuance intention, was measured using 5 indicators capturing intention to use, intention to continue using, and willingness to recommend the service to others (word-of-mouth) (Alojail, 2024; Jeilani & Hussein, 2025; Mackert et al., 2016; Negash & Calahorrano Sarmiento, 2023; Yao et al., 2022).

The target population consists of Indonesian adults aged 18 years or above who experience overweight or obesity, indicated by a self-reported body mass index (BMI) of 25 or higher, and who have used a digital obesity management application such as Halofit, Light Coach, FatSecret, or MyFitnessPal for at least one month before the survey. The unit of analysis is the individual as a consumer of digital health services. A purposive sampling technique was applied to ensure that respondents met these criteria. The online survey was distributed through digital health and wellness communities, social media platforms associated with fitness and nutrition applications, and, where available, partner clinics or telehealth providers.

The minimum sample size was determined following the PLS-SEM 5-times rule, which recommends a sample size of at least ten times the largest number of measurement indicators used to measure a single construct (Hair, Black, et al., 2019). Given that the study used 48 indicators, a minimum sample size of 240 respondents was considered adequate to ensure sufficient statistical power for model estimation.

Before the main data collection, a pilot test involving 30 respondents who met the study criteria was conducted to assess item clarity, content validity, and preliminary reliability. Minor wording refinements were made based on pilot feedback to enhance clarity and contextual relevance. The main data collection was conducted online using Google Forms over two months, from December 2025 to January 2026. Participation was voluntary, and informed consent was obtained electronically before respondents proceeded with the survey. To address ethical considerations related to the sensitivity of obesity-related topics, anonymity and confidentiality were strictly maintained, no personally identifiable information was collected, and non-stigmatizing language was consistently used throughout the questionnaire.

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software. PLS-SEM was selected due to its suitability for theory development and extension, prediction-oriented research objectives, and complex structural models involving multiple mediating and moderating variables (Hair, Risher, et al., 2019). The analysis followed a two-stage procedure, beginning with the evaluation of the measurement model to assess indicator reliability, internal consistency, convergent validity, and discriminant validity, followed by the assessment of the structural model to examine path coefficients, mediation and moderation effects, explanatory power (R^2), and predictive relevance (Q^2). Hypothesis testing was conducted using a bootstrapping procedure with 5,000 resamples.

RESULTS AND DISCUSSION

Results

This study included 379 respondents who met the study's criteria for participation regarding the adoption of obesity mHealth services in Indonesia. By gender, the majority of respondents were women (55.7%), while men accounted for 44.3%. By age, the largest group was 26–35 years (35.4%), followed by 36–45 years (27.2%) and 18–25 years (19.0%), indicating dominance of the productive age group.

The respondents' level of education was relatively high, with most holding a Bachelor's (S1) degree (45.1%), followed by high school/equivalent (25.3%), diploma (16.1%), and postgraduate (13.5%). In terms of employment, almost half of the respondents were employed (49.3%), followed by entrepreneurs (20.8%), students (15.3%), and unemployed (14.5%). The most common monthly income ranges were IDR 3-5 million (32.5%) and IDR 5-10 million (29.3%), reflecting variation in purchasing power for digital health services.

Based on BMI categories, the majority of respondents were in Class I Obesity (41.2%) and Overweight (37.7%),

while 21.1% were Class II Obesity. Most respondents (65.4%) have used health apps, with the most used apps including Halofit (19.0%), FatSecret (16.6%), MyFitnessPal (15.6%), and Light Coach (14.2%). Geographically, respondents were predominantly urban residents (69.7%) and were domiciled on Java (49.9%), followed by Sumatra (23.2%) and other regions, indicating national representation despite their concentration in urban areas and on Java.

TABLE 1. Characteristics of Respondents (N = 379)

Characteristics	Category	Quantity (n)	Percentage (%)
Gender	Man	168	44,3
	Woman	211	55,7
Age (years)	18–25	72	19,0
	26–35	134	35,4
	36–45	103	27,2
	46–55	52	13,7
	>55	18	4,7
Education Level	High School/equivalent	96	25,3
	Diploma	61	16,1
	Bachelor (S1)	171	45,1
	Postgraduate (S2/S3)	51	13,5
Employment Status	Student	58	15,3
	Employees	187	49,3
	Entrepreneurship	79	20,8
	Not working	55	14,5
Monthly Income	< IDR 3 million	94	24,8
	IDR 3–5 million	123	32,5
	IDR 5–10 million	111	29,3
	> IDR10 million	51	13,5
Category BMI	Overweight	143	37,7
	Class I Obesity	156	41,2
	Class II Obesity	80	21,1
Use of Health Apps	Used	248	65,4
	Never before	131	34,6
Types of Applications Used*	Halofit	72	19,0
	Light Coach	54	14,2
	FatSecret	63	16,6
	MyFitnessPal	59	15,6
	Others	0	0,0
Domicile	Urban	264	69,7
	Rural	115	30,3
Region of Residence	Jawa	189	49,9
	Sumatera	88	23,2
	Kalimantan	41	10,8
	Sulawesi	38	10,0
	Bali & Nusa Tenggara	15	4,0
	Maluku & Papua	8	2,1

The evaluation of measurement (outer) models in the PLS-SEM approach aims to ensure that each latent construct meets the criteria for validity and reliability before structural model testing is conducted. Theoretically, convergent validity was assessed through outer loading values (>0.70) and Average Variance Extracted (AVE >0.50), while internal reliability was evaluated through Cronbach's Alpha (CA >0.70) and Composite Reliability (CR >0.70). In addition, the Variance Inflation Factor (VIF < 5) is used to identify potential multicollinearity among indicators. Based on Table 2, all indicators in the constructs of Digital Self-Management Capability (DSMC), Perceived Ethical Digital Health Marketing (PEDHM), Quality of Life Improvement (QoLI), Consumer Trust (CT), Obesity Stigma Reduction (OSR), and Adoption & Continuance Intention (ACI) have an outer loading above 0.79, indicating strong convergent validity. The AVE for the entire variable ranged from 0.746 to 0.794, exceeding the minimum limit. CA and CR are also very high (≥ 0.935), confirming excellent internal consistency. The VIF values for all indicators are below 5, indicating no multicollinearity that would interfere with the measurement model.

TABLE 2. Measurement (Outer) Model Evaluation

Variable	Indicator	Outer Loading	AVE	CA	CR	VIF Outer
Digital Self-Management Capability (DSMC)	DSMC1	0.879	0.755	0.964	0.969	3.879
	DSMC2	0.868				3.619
	DSMC3	0.857				3.338
	DSMC4	0.854				3.140
	DSMC5	0.856				3.218
	DSMC6	0.880				3.731
	DSMC7	0.886				3.927
	DSMC8	0.871				3.754
	DSMC9	0.877				3.858
	DSMC10	0.859				3.290
Perceived Ethical Digital Health Marketing (PEDHM)	PEDHM1	0.792	0.752	0.963	0.968	2.554
	PEDHM2	0.854				3.503
	PEDHM3	0.889				4.701
	PEDHM4	0.873				3.957
	PEDHM5	0.886				3.886
	PEDHM6	0.873				3.829
	PEDHM7	0.860				3.429
	PEDHM8	0.873				3.853
	PEDHM9	0.881				4.132
	PEDHM10	0.885				3.935
Quality of Life Improvement (QoLI)	QoLI	0.858	0.758	0.954	0.962	3.399
	QoL2	0.855				3.194
	QoL3	0.857				3.110
	QoL4	0.897				4.222
	QoL5	0.881				3.580
	QoL6	0.875				3.454
	QoL7	0.833				2.919
	QoL8	0.905				4.351
Consumer Trust (CT)	CT1	0.905	0.787	0.946	0.957	3.860
	CT2	0.880				3.169
	CT3	0.866				2.952
	CT4	0.889				3.377
	CT5	0.883				3.214
	CT6	0.897				3.616
Obesity Stigma Reduction (OSR)	OSR1	0.874	0.746	0.957	0.963	3.527
	OSR2	0.851				2.963
	OSR3	0.864				3.203
	OSR4	0.884				3.700
	OSR5	0.883				3.907
	OSR6	0.864				3.256
	OSR7	0.871				3.456
	OSR8	0.861				3.277
	OSR9	0.818				2.677
Adoption & Continuance Intention (ACI)	ACI1	0.846	0.794	0.935	0.951	2.483
	ACI2	0.916				4.145
	ACI3	0.896				3.393
	ACI4	0.906				3.620
	ACI5	0.889				3.330

The evaluation of discriminant validity was conducted using the Heterotrait-Monotrait Ratio (HTMT) approach, which is considered adequate if the HTMT value is below the threshold of 0.90 (or more conservatively 0.85). This test aims to ensure that each construct in the model is empirically distinct and does not conceptually overlap with any other. Based on Table 3, the HTMT values for the constructs range from 0.505 to 0.791, which are still below the 0.90 threshold. The highest correlations were between DSMC and ACI (0.791) and between QoL and ACI (0.787), indicating relatively strong relationships but remaining within acceptable limits. The values for OSR-CT (0.684) and PEDHM-OSR (0.696) also showed a moderate correlation, without indicating a discriminatory

problem.

TABLE 3. Discriminant Validity-HTMT

	ACI	CT	DSMC	OSR	PEDHM	QoL
ACI						
CT	0,603					
DSMC	0,791	0,505				
OSR	0,683	0,684	0,532			
PEDHM	0,635	0,602	0,596	0,696		
QoL	0,787	0,692	0,595	0,595	0,691	

The evaluation of the inner model (structural model) in PLS-SEM aims to assess the strength and significance of relationships among latent constructs. Significance testing was performed using bootstrapping to obtain the T-statistic and P-value, with a significance threshold of $p < 0.05$. In addition, the effect size (f^2) was used to assess the contribution of each exogenous variable to the endogenous variable (0.02 = small; 0.15 = medium; 0.35 = large). Based on Table 4 and Figure 2, Digital Self-Management Capability (DSMC) had a significant effect on Quality of Life Improvement ($\beta=0.538$; $p<0.001$), Consumer Trust ($\beta=0.527$; $p<0.001$), and Obesity Stigma Reduction ($\beta=-0.951$; $p<0.001$), with a very large effect on stigma ($f^2=4.632$). Perceived Ethical Digital Health Marketing (PEDHM) had a significant effect on Quality of Life ($\beta=0.435$) and Trust ($\beta=0.451$), but not on Stigma Reduction. Furthermore, Quality of Life ($\beta=0.247$), Consumer Trust ($\beta=0.490$), and Obesity Stigma Reduction ($\beta=0.236$) significantly improved Adoption and Continuance Intention, with Trust showing the greatest effect ($f^2=0.256$).

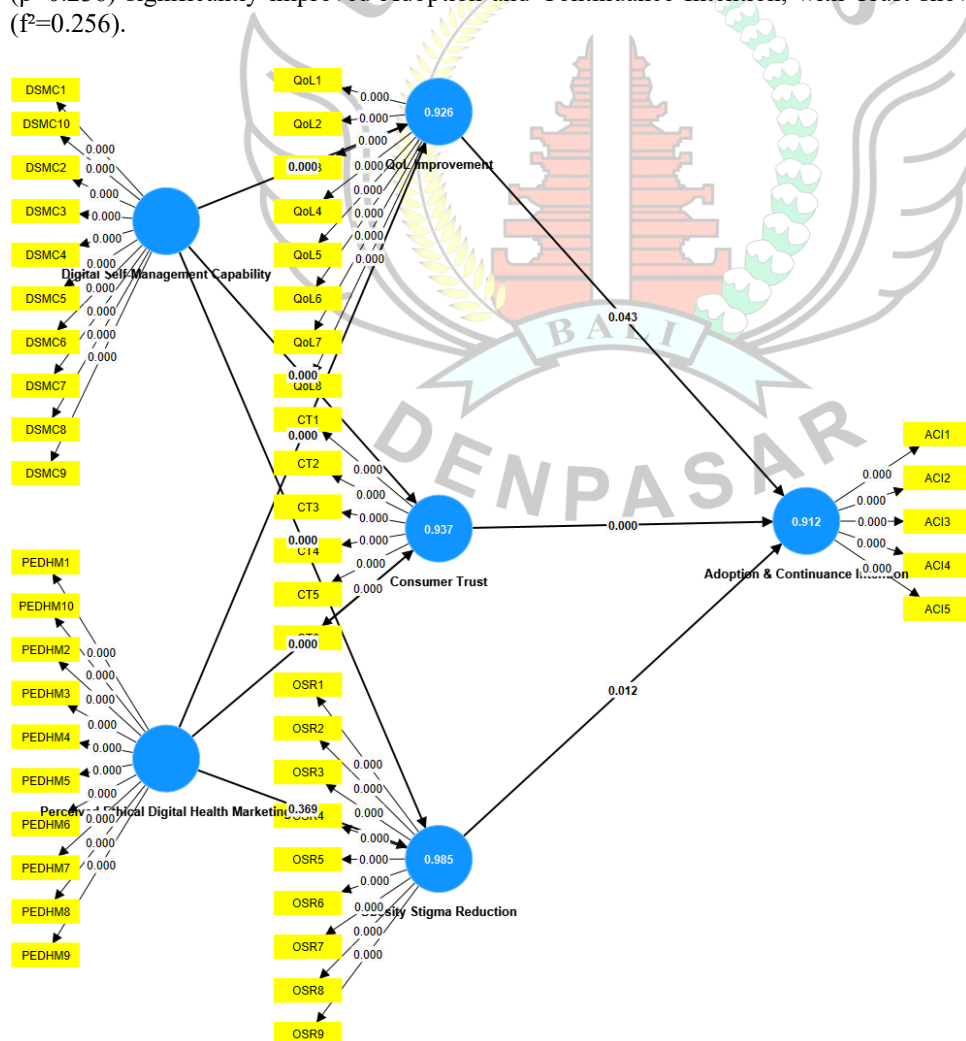


FIGURE 2. Bootstrapping Output

TABLE 4. Hypothesis Results

Hypothesis	Relationships Variables	Between	Path Coefficient (β)	T-Statistic	P-Value	Decision	f ²
H1	Digital Capability →	Self-Management Quality of Life Improvement	0.538	5.485	0.000	Supported	0.306
H2	Digital Capability →	Self-Management Consumer Trust	0.527	5.954	0.000	Supported	0.343
H3	Digital Capability →	Self-Management Obesity Stigma Reduction	-0.951	20.733	0.000	Supported	4.632
H4	Perceived Ethical Marketing →	Digital Health Quality of Life Improvement	0.435	4.307	0.000	Supported	0.200
H5	Perceived Ethical Marketing →	Digital Health Consumer Trust	0.451	5.050	0.000	Supported	0.251
H6	Perceived Ethical Marketing →	Digital Health Obesity Stigma Reduction	-0.043	0.899	0.369	Not Supported	0.009
H7	Quality of Life Improvement →	Adoption and Continuance Intention	0.247	2.026	0.043	Supported	0.050
H8	Consumer Trust →	Adoption and Continuance Intention	0.490	4.299	0.000	Supported	0.256
H9	Obesity Stigma Reduction →	Adoption and Continuance Intention	0.236	2.512	0.012	Supported	0.051

The coefficient of determination (R^2) is used to evaluate the inner model and measure the extent to which exogenous variables explain variation in endogenous variables. In general, the R^2 value of 0.75 is categorized as strong, 0.50 moderate, and 0.25 weak. The Adjusted R^2 value provides a more accurate estimate because it accounts for the number of predictors in the model. Based on Table 5, all endogenous variables exhibit very strong explanatory power. Quality of Life Improvement has an R^2 of 0.926, which means that Digital Self-Management Capability and Perceived Ethical Digital Health Marketing explain 92.6% of the variance. The Consumer Trust shows an R^2 of 0.937, while the Obesity Stigma Reduction reaches 0.985, indicating the very high predictive ability of exogenous constructs. Adoption and Continuance Intention had an R^2 of 0.912, indicating that Quality of Life, Consumer Trust, and Obesity Stigma Reduction explained 91.2% of the variance.

TABLE 5. R-Square Result

Variable Endogenous	R-Square (R^2)	R-Square Adjusted
Quality of Life Improvement	0.926	0.926
Consumer Trust	0.937	0.936
Obesity Stigma Reduction	0.985	0.985
Adoption and Continuance Intention	0.912	0.911

Discussion

The study results show that Digital Self-Management Capability (DSMC) significantly influences three key variables in the adoption of obesity mHealth services in Indonesia: improving quality of life, consumer trust, and reducing obesity stigma. K at H1, DSMC had a positive effect on Quality of Life Improvement ($\beta = 0.538$; $t = 5.485$). These findings align with the literature showing that digital self-management improves psychological well-being, self-efficacy, and self-control, and reduces obesity distress, thereby strengthening perceptions of overall quality of life (Aukan et al., 2025; Bertoli et al., 2025; Palmeira et al., 2016). A fairly high coefficient value shows that the higher an individual's ability to manage their health digitally—such as monitoring diet, physical activity, and weight progress through apps—the greater their perception of improving quality of life. This can be explained by the theory of self-efficacy, which holds that the ability to control health behaviors increases a sense of competence and autonomy. In the context of obesity, which is often associated with chronic conditions and comorbidities, digital self-management skills help individuals feel more empowered, thereby improving their

physical and psychological well-being. Thus, technology is not only a monitoring tool but also a means of empowerment that enhances perceived control and quality of life.

H2 shows that DSMC has a significant positive effect on Consumer Trust ($\beta = 0.527$; $t = 5.954$). These findings are consistent with previous research showing that consistent, personalized, and easy-to-use digital self-management systems increase trust in technology and service providers, especially through transparency, reliability, and clinical integration that reinforce perceptions of legitimacy and security (Dadgar & Nickel, 2025; Hui et al., 2021; El-Annan & Hassoun, 2024). These findings indicate that when users feel they can understand and use the app's features effectively, they tend to have higher trust in the service. Trust in digital healthcare is crucial as it concerns personal data, the accuracy of medical recommendations, and the sustainability of use. Individuals with strong digital skills are better able to evaluate information credibility, understand how the application works, and interpret health feedback. This reduces the uncertainty that often hinders the adoption of health technology. In other words, digital competence provides a cognitive foundation for building trust in the mHealth system.

H3 provides interesting findings: DSMC has a significant effect on Obesity Stigma Reduction, with a very strong negative coefficient ($\beta = -0.951$; $t = 20.733$). The negative direction suggests that higher digital self-management capability is associated with lower perceptions or experiences of obesity stigma. The magnitude of the coefficient indicates a very strong psychological and social relationship. These findings are in line with the literature showing that digital self-management provides a private and non-judgmental space that suppresses internalized weight stigma through increased self-efficacy and self-compassion, thereby helping to reconstruct the experience of obesity in a more positive and supportive way (Kearns et al., 2025; Hilbert et al., 2015; O'Shea et al., 2024). This is understandable because the use of mHealth services allows individuals to manage their obesity condition privately and personally without having to face social stigma directly, such as in face-to-face consultations. In addition, educational and progress tracking features can increase self-acceptance and reduce internalized stigma. When individuals feel in control and see measurable progress, negative self-perceptions tend to decline.

The results of the hypothesis test showed that Perceived Ethical Digital Health Marketing (PEDHM) played a significant role in shaping perceptions of quality of life and consumer trust in obesity mHealth services in Indonesia, but did not significantly reduce obesity stigma. These findings provide important insights into the limitations and potential of ethical marketing strategies in the context of digital healthcare.

On H4, PEDHM had a significant positive effect on Quality of Life Improvement ($\beta = 0.435$; $t = 4.307$; $p < 0.001$). These findings are consistent with the literature showing that ethically perceived digital interventions increase user engagement, compliance, and security, thereby positively impacting physical and psychological well-being and health-related quality of life (Guo et al., 2025; Khan et al., 2025). This suggests that when consumers view digital marketing strategies as transparent, honest, non-manipulative, and education-based, they tend to have a more positive perception of how services affect their quality of life. In the context of obesity, which is often associated with overclaims and the exploitation of self-confidence, ethical marketing approaches can reduce skepticism and increase perceived value. Accurate, evidence-based information helps consumers understand the realistic benefits of the service, thereby increasing healthy expectations and user satisfaction. Thus, ethical marketing not only serves as a promotional tool but also as a mechanism for shaping perceptions of well-being.

H5 shows that PEDHM also has a significant positive effect on Consumer Trust ($\beta = 0.451$; $t = 5.050$; $p < 0.001$). These findings are in line with the literature that confirms that data transparency, claims honesty, and ethical AI governance strengthen consumer trust as a key outcome of ethical marketing, while also serving as an integrity signal that mediates adoption intent and loyalty (El-Annan & Hassoun, 2024; Mujollari et al., 2025; Cherchem et al., 2025). These findings are consistent with the literature on trust-building in digital services, where transparency, data protection, and responsible communication are key determinants of trust. In the digital health industry, data privacy and security are central concerns. When marketing emphasizes regulatory compliance, clear benefits, and avoiding exploitation of consumer fear or embarrassment, the perception of risk is reduced. Trust formed through ethical communication plays a crucial role in driving user adoption and retention. In other words, marketing ethics function as a credibility signal that strengthens the legitimacy of mHealth services.

In contrast, H6 was not statistically supported ($\beta = -0.043$; $t = 0.899$; $p = 0.369$), suggesting that PEDHM had no significant effect on Obesity Stigma Reduction. These results contradict the literature suggesting that ethical and inclusive digital marketing can reduce stigma by framing obesity in a non-blaming manner and emphasizing its biological and social complexities (Varshney, 2021; Oliver et al., 2017). In fact, stigma-sensitive design and communication are seen as ethical prerequisites in digital obesity care (Zheng et al., 2025). These findings are interesting because they indicate that even if marketing is done ethically, it is not necessarily enough to reduce the stigma of obesity. The stigma of obesity is complex and rooted in broader social, cultural, and structural biases. Ethical marketing may avoid blaming language, but reducing stigma requires more in-depth interventions, such as inclusive social campaigns, diverse body representation, and long-term public education. In addition, stigma is often internalized, so it is influenced more by personal experiences and psychosocial support than by marketing messages alone.

The results of the H7–H9 hypothesis test confirm that Quality of Life Improvement, Consumer Trust, and Obesity

Stigma Reduction are significant determinants of the Adoption and Continuance Intention of obesity mHealth services in Indonesia. These three variables are the main psychological mechanisms linking user perceptions to actual behavioral decisions to use and continue using digital health services.

On H7, Quality of Life Improvement on Adoption and Continuance Intention showed a significant positive effect ($\beta = 0.247$; $t = 2.026$; $p = 0.043$). These findings are consistent with the literature showing that improving quality of life as a perceived value outcome strengthens perceived usefulness, satisfaction, and intention to adopt and sustain the use of mHealth, especially when the health benefits are perceived by users (Akter, D'Ambra, et al., 2013; Alam et al., 2022; Wang et al., 2022). Although the value of the relative coefficient and the effect size ($f^2 = 0.050$) are relatively small, these results are still theoretically important. The perception of improving quality of life—both in physical aspects (weight loss, increased energy), psychological (confidence), and social—is an intrinsic motivator for maintaining service use. In the context of health behavior, individuals tend to pursue an intervention when they perceive a benefit. This aligns with the Expectation-Confirmation Model (ECM), in which satisfaction and confirmation of benefits drive continuance intention. In other words, when users feel a positive impact on their well-being, the decision to stick with the app becomes rational and experience-based. However, the relatively small magnitude of the influence compared to other variables indicates that the perception of quality of life alone is not strong enough to be the main driver of sustainable adoption. In digital healthcare, benefits are often gradual and take time. Therefore, other factors, such as trust and psychological comfort, may play a more significant role.

The findings were supported by H8, which showed that Consumer Trust \rightarrow Adoption and Continuance Intention had the strongest influence ($\beta = 0.490$; $t = 4.299$; $p < 0.001$; $f^2 = 0.256$). These findings align with studies showing that trust significantly increases mHealth adoption and continuance intention and mediates the effects of service quality and risk perception on sustainable use (Deng et al., 2018; Li et al., 2022; Meng et al., 2022). The effect size, classified as medium to strong, indicates that trust is the main predictor of the adoption decision and the sustainability of use of obesity mHealth services. In the context of digital healthcare services in Indonesia, issues of data security, the accuracy of medical information, and the credibility of service providers are sensitive. Trust reduces perceived risk and uncertainty inherent in digital health technology. Furthermore, trust functions as a relational governance mechanism in a digital environment with minimal face-to-face interaction. When users are confident that the app maintains data privacy, provides evidence-based recommendations, and does not exploit their conditions. The psychological barriers to continuing to use the service are significantly reduced. The dominance of trust in this model confirms that in the digital health ecosystem, cognitive-relational factors are often more decisive than functional benefits alone.

H9 showed that Obesity Stigma Reduction \rightarrow Adoption and Continuance Intention also had a significant positive effect ($\beta = 0.236$; $t = 2.512$; $p = 0.012$; $f^2 = 0.051$). These findings are in line with studies showing that stigma leads to healthcare avoidance, while supportive and non-stigmatic framing increases user acceptance and engagement; conversely, weight bias degrades long-term care quality and adherence (Hollmann et al., 2024; Albury et al., 2020; Phelan et al., 2015). Although the effect size is relatively small, its statistical significance confirms the importance of the psychosocial dimension in the adoption of obesity services. The stigma of obesity, both social and internalized, can be a major obstacle to seeking help. mHealth services offer a more private and nonjudgmental space than face-to-face consultations, so when users feel less stigma, they are more likely to stay engaged with the platform. Interestingly, the magnitude of the influence of stigma reduction is comparable to the magnitude of the improvement in quality of life, suggesting that the emotional and social dimensions carry similar weight to the physical well-being dimension in influencing behavioral decisions. This underscores that clinical outcomes do not solely drive the adoption of obesity services; they are also shaped by psychological security.

CONCLUSIONS AND SUGGESTION

Conclusions

This study explains how consumer decisions to adopt and continue using obesity mHealth services in Indonesia are shaped by technological, relational, and psychosocial factors. The findings highlight that Digital Self-Management Capability (DSMC) significantly enhances quality of life, builds consumer trust, and reduces perceived obesity-related stigma. Among all determinants, consumer trust emerges as the strongest predictor of adoption and continuance intention, underscoring the critical role of data security, system transparency, and information credibility. In addition, quality of life improvement and stigma reduction positively influence sustained usage, indicating that consumer decisions extend beyond clinical outcomes to include psychological comfort and perceived well-being. While Perceived Ethical Digital Health Marketing strengthens trust and quality of life, it does not directly reduce stigma, suggesting that stigma requires broader, more targeted interventions beyond marketing communication alone. This study extends existing mHealth adoption models by integrating a value-based perspective that incorporates trust, stigma reduction, and quality of life as key mediating mechanisms, moving beyond a purely utilitarian and clinical focus. The findings provide actionable insights for digital health providers to design obesity services that prioritize trust-building, personalization, and stigma-sensitive

approaches, thereby enhancing both adoption and long-term engagement.

Suggestion

Based on the study's findings, the development of obesity mHealth services in Indonesia should be guided by a more personalized, ethical, and trust-based approach. First, developers should enhance DSMC through AI-driven personalized features, while ensuring transparency in data usage and algorithmic processes to strengthen trust. Integration with certified healthcare institutions and evidence-based content is essential. Second, mHealth platforms should adopt inclusive and non-stigmatizing design principles, including neutral language, diverse representation, and moderated anonymous communities to foster psychological safety. Third, digital marketing strategies should emphasize education-based communication, framing obesity as a multifactorial condition rather than an individual failure. Finally, policymakers should establish clear data governance and ethical guidelines for mHealth services, supported by collaboration among government, healthcare providers, and technology developers.

This study has several limitations. First, the use of a cross-sectional design limits the ability to capture behavioral changes over time. Second, the reliance on self-reported data may introduce response bias. Third, the study focuses on Indonesia, which may limit generalizability to other cultural or healthcare contexts. Future research is encouraged to adopt longitudinal designs to better understand continuance behavior, incorporate objective health and usage data, and explore cross-country comparisons. Additionally, further studies could examine the role of emerging technologies such as AI explainability and digital therapeutics in shaping trust and long-term engagement in mHealth services.

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