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Enhancing Knowledge, Medication Adherence and Technology Acceptance of HeartIn® Mobile App Among Geriatric Hypertensive Patients: A Quasi-Experimental Study

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ABSTRACT

The advent of innovation in the health sector through technological development provides a potential for health improvement of the population. Technology is important in ensuring firm performance (Sy, 2025). This, however, is challenging in rural settings where technology including internet connectivity is slow. This study evaluated the effectiveness of the HeartIn mobile health application in managing hypertension among geriatric patients. This is through the use of quantitative and quasi-experimental research among 30 geriatric patients with hypertension and other comorbidities. Specifically, it assessed the impact of the app on patient knowledge, technology acceptance, medication adherence, and blood pressure regulation. Data were collected using standardized instruments, including knowledge questionnaires, the Technology Acceptance Model (TAM) constructs, the Malaysian Medication Adherence Scale (MALMAS), and daily blood pressure readings over 15 days. Statistical analyses included independent sample t-tests, effect size computations, and multiple regression analysis. The results of the study showed that the experimental group experienced significant improvements in knowledge and technology acceptance, with a very large effect size using Cohen's d. Although blood pressure reductions were clinically meaningful, they were not statistically significant. Regression analysis revealed a strong model identifying Patient Knowledge as the most significant predictor of HeartIn App adoption, while Knowledge of Lifestyle Modification was also significant but negatively associated. TAM-based variables, such as Perceived Usefulness and Ease of Use, were not significant predictors in the regression model.

***Keywords*:** geriatric patients, HeartIn App, hypertension management, MALMAS, Technology Acceptance Model, patient knowledge

INTRODUCTION

Today, the adoption of mobile technology is profoundly intertwined with individuals' daily lives. It revolutionized communication, work, entertainment, and also access to information including health. The advent of mobile health (mHealth) applications drastically transformed the healthcare environment and mHealth has proven to be essential in enhancing healthcare access. The healthcare industry is faced with challenges like limited healthcare infrastructure and insufficient access to specialists (Walker et al., 2021). These are all prevalent in rural settings of the Philippines as indicated in various studies such as those by Gonzales et al. (2018). Many authors highlighted that these issues can be abated by the effectiveness of mHealth applications in delivering health education, remote monitoring, and promoting health-seeking behavior. However, challenges remain in ensuring the effective adoption and sustained use of mHealth by patients to improve medical conditions. As these technologies evolve, it becomes crucial to assess how well mHealth apps meet the needs of patients and healthcare providers, particularly in areas where healthcare delivery systems are underdeveloped.

The integration of mHealth apps enables remote patient monitoring, health education, and timely consultations with healthcare providers which are critical in improving health outcomes. The study by Patel and Kumar (2021) similarly pointed out that mHealth apps contribute significantly to bridging the healthcare gap by overcoming challenges in the shortage of healthcare professionals and a lack of proper facilities in rural areas. In parallelism, Rodriguez et al. (2022) emphasized that mHealth applications hold great promise for empowering patients in rural regions to take control of their health.

This study utilized HeartIn Mobile App which is an mHealth App used as a tool to help patients improve their hypertension condition through intervention. HeartIn Mobile is a digital health tool already existing in the market designed to assist individuals in managing hypertension through self-monitoring and personalized insights. The digital tool influenced knowledge, behavior, and clinical outcomes among elderly individuals in the study. HeartIn App is a mobile application used by patients easily by downloading it for a fee through Google Play. It has features like blood pressure tracking, personalized insights, user-tailored recommendations for hypertensive patients, and insights based on readings to help manage and improve heart health. Moreover, it also provided medication reminders to take patient medications as prescribed by doctors, enhancing adherence to treatment plans. It also shared health data needed with healthcare providers such as doctors and nurses to facilitate informed discussions during medical appointments. Other features include educational resources. By integrating HeartIn Mobile App into the patient's Hypertension Management, it created benefits such as empowering the patients with the tools and information needed to take control of hypertension, it provided app-based reminders that increased the frequency of taking

blood pressure, taking medications correctly as described in the study by Kassavou et al. (2022) and the American Heart Association. It likewise helped patients consistently track blood pressure and access educational content.

The importance of this study is in its potential to contribute to the global understanding of mHealth applications to enhance healthcare delivery, especially in underserved and rural areas. The use of HeartIn Mobile was found to improve the Hypertension conditions of patients. On a global scale, as healthcare systems worldwide continue to grapple with limited resources, rural populations, and disparities in access to care, mHealth offers a promising solution to bridge these gaps (Kassavou et al., 2022). This study provided insights on healthcare interventions similar in context with the study by López et al. (2018) and Parikh et al. (2016). In the Philippines, this study is vital as it will address specific geographical challenges such as isolation, lack of healthcare infrastructure, and a shortage of healthcare professionals (Gonzales et al., 2018; Rodriguez et al., 2022). The results are expected to present a pathway to overcoming the barriers in improving healthcare access crucial for enhancing health outcomes in rural communities (Singh et al., 2020; Patel & Kumar, 2021). The results also on leveraging technology us expected to contribute to the development of more accessible, equitable, and efficient healthcare solutions for local populations, Ultimately, it improving the quality of life for individuals living in rural areas (De Guzman et al., 2020; Walker et al., 2021).

The key variables of this study are technology acceptance indicated by perceived ease of use and perceived usefulness of technology as the patient navigates its features on the one hand. On the other hand, is patients' knowledge indicated by an understanding of hypertension and its risks, awareness of BP measurement and management, and the knowledge of lifestyle modifications for hypertension control. Both technology acceptance and patient knowledge were found essential to understanding the effectiveness of the HeartIn Application in improving healthcare delivery. These variables and indicators were found interlinked, as they collectively help improve healthcare access, quality, and patient outcomes in rural communities. The purpose of this study was to assess the effectiveness of the HeartIn Mobile Heart Rate Application (HeartIn Mobile App) in improving patient outcome - blood pressure control. This study found HeartIn App helpful to patients.

This study was anchored on the Technology Acceptance Model (TAM) which is a widely used theory in the field of information systems and technology adoption, developed by Fred D. Davis (Davis, 1989). The TAM was used to understand how users come to accept and use new technologies, focusing on the factors that influence their decisions to adopt a particular technology. Specifically, it identifies the psychological constructs that influence users' attitudes toward technology, their perceived ease of use, and perceived usefulness, which ultimately affect their intention to use the technology. The information generated from the technology is critical as it becomes part of the body of knowledge among organizations especially in the supply chain context (Sy and Gempes, 2023).

The Technology Acceptance Model was based on five fundamental assumptions including making rational decisions about technology adoption. The theory posited that users assess the usefulness and ease of use of a technology before adopting it. People make informed decisions based on these perceptions. The theory also believed that perceived ease of use and perceived usefulness are the primary predictors of acceptance. The model assumed that two key factors—perceived ease of use and perceived usefulness—drive users' attitudes toward technology, which in turn influences their behavior.

The conceptual framework of the study used the Input-Process-Output (IPO) Approach. It is a straightforward and widely used conceptual framework for understanding how different variables and factors interact within a system to produce outcomes. The framework broke down the system into three core components including Inputs, Processes, and Outputs. This approach helps in analyzing the flow of information or resources and understanding how various factors contribute to the outcomes. In this study, the IPO framework was applied to understand how Technology Acceptance and Patients' Knowledge contributed to the outcome of better Hypertension Control.

This study aims to determine the impact of adopting HeartIn Mobile on geriatric hypertensive patients and its effect on patient engagement and health outcomes. Specifically, this study aims to determine the levels of intervention of patients' knowledge, technology acceptance, and medication adherence before and after the HeartIn Mobile Heart Rate Application intervention. It will also evaluate the significant difference in patients' knowledge, technology acceptance, and medication adherence before and after the HeartIn Mobile Heart Rate Application intervention. The study also aims to evaluate the significant difference in patients' knowledge, technology acceptance, and medication adherence with and without the HeartIn Mobile heart Rate Application Intervention. Finally, the study will identify the effect size after the use of HeartIn Mobile Heart Rate Application intervention.

METHODOLOGY

This study employed a quantitative, quasi-experimental research methodology. According to Creswell (2018), quantitative research involves collecting and analyzing numerical data to identify patterns, relationships, or trends. It is typically aimed to test hypotheses or examine the cause-and-effect relationships between variables. It is often used to measure the extent of a phenomenon and can be used to predict outcomes or compare conditions of various groups. Creswell (2018) emphasized that quantitative research involves structured data collection methods, such as surveys or experiments, that result in numerical data.

This study specifically employed quasi-experimental research which is a type of quantitative methodology. It ws used to evaluate the cause-and-effect relationships between variables of the study when random assignment to different groups is not feasible or ethical (Maciejewski, 2018). A quasi-experimental design, unlike true experimental designs which involve randomization, relies on natural conditions occurring within a group. This may include conditions that were pre-existing cohorts or self-selected groups. These designs are often conducted in real-world settings where randomization is impractical like healthcare interventions. It makes the design especially relevant for studying mHealth applications. There are several downsides of a quasi-experimental design such as the lack of randomization. Participants are not randomly assigned to treatment and control groups. Instead, groups may

be based on existing characteristics, such as individuals who opt into an intervention or those who already receive a specific treatment. In addition, quasi-experimental designs often involve comparison groups like control vs. experimental groups to assess the effects of an intervention. However, the comparison groups may not be randomly selected, which may limit the ability of the study to rule out confounding variables.

This study was conducted at a selected hospital in Hinatuan, Surigao del Sur, Philippines. The research locale was selected because the researcher is from the area. Moreover, the researcher also based on local data found in the Philippine Atlas (2025), the aging population in Hinatuan is 10% from age 60 years old and above. According to the Department of Health (DOH) in the Philippines, hypertension is a prevalent health issue among the elderly population. A study published in the Philippine Journal of Internal Medicine in 2018 reported that approximately 50% of Filipino adults aged 60 and above suffer from hypertension. This high prevalence underscores the importance of regular health check-ups and effective management strategies to control blood pressure among the elderly. The DOH emphasizes the need for public health initiatives aimed at raising awareness and providing accessible healthcare services to address hypertension in this age group.

The experimental group of the study was asked to use the app for free temporarily during the 15-day study duration of the intervention program. The researcher initially asked the patients to participate in the study and monitor their blood pressure regularly at least twice a day at 7:00 AM and 8:00 PM. Monitoring blood pressure at consistent times, such as 7 AM and 8 PM, was recommended for hypertensive patients to obtain accurate and representative readings. This practice helps account for natural fluctuations in blood pressure throughout the day and provides a comprehensive view of the patient's condition. Taking a reading shortly after waking up, before consuming food or medications, at least at 7:00 AM offers a baseline measurement. This approach is suggested by Kobalava et al. (2011) suggesting that morning home blood pressure should be measured before antihypertensive drug dosing. In addition, an evening reading, such as at 8 PM, captures the blood pressure level before bedtime, reflecting the body's natural circadian rhythm. This practice is supported by studies indicating that measurement of home blood pressure twice in the morning and evening, preferably for 15 days, provides a thorough image of a patient's blood pressure level. By adhering to these guidelines, patients can provide their healthcare providers with reliable data, facilitating better management of hypertension.

This study is a quasi-experimental design, with non-random sampling methods used due to practical constraints specifically on the inability to randomly assign patients to the test or control group. The study used a convenience sampling design. Patients who were available and willing to participate, identified from the hospital database or recommended by health practitioners for the same hospital, were invited to join the study. This was done by selecting demographic groups including age, gender, and socio-economic profiles as indicated in the selection criteria. Patients were conveniently selected to ensure diversity in the sample. The sampling design for a quasi-experimental study is structured to assess the impact of a mHealth app on hypertension management. By using 15 patients each for both the test and control groups, this study was able to compare the effectiveness of the HeartIn app. While the study's non-randomized nature limited causal inferences, it provided valuable insights into the potential benefits of mHealth interventions. However, the limitations were shown and presented in the results.

The data collection involved three phases which are the pre-intervention, intervention period, and post-intervention. In the pre-intervention, data were collected after the approval and signing of the patients to participate in the study. The researcher collected baseline data from all patient respondents including blood pressure, medication adherence, and lifestyle habits. The researcher conducted a Pretest on the knowledge of the patients on Hypertension. Based on the baseline data, the researcher identified which patients belonged to either the experimental or the control groups. The test group patients were those who have used other hypertension apps, are technology-oriented, or are willing to learn an app. The rest were assigned to the control group.

During the intervention period, patients in the experimental group used the HeartIn Mobile App for 15 days in February 2025 while the control group followed the standard hospital care. The collection was done every day at twice-a-day intervals of the blood pressure done by the patients through the local health center for outpatients and through the nurses of the hospital for inpatient participants. Then patients in the experimental group were asked to record the information on the HeartIn Mobile App.

Finally, in the post-intervention, the data on the same variables were collected, reviewed if complete, and assessed regarding changes in blood pressure, medication adherence, and any other relevant outcomes. It was expected that since there is a non-random assignment, the researcher expected that there were inherent differences between the test and control groups that could confound the results like patients in the test group may be more motivated to engage in health behaviors. In addition, with only 30 participants, the study was found to be insufficient in power.

RESULTS AND DISCUSSION

The demographic profile of the participants indicate that the age profile shows a majority or 70% of those who visited the hospital are generally within the age range of 61-70 years old followed by 71-80 years old (26.67%). The patients and respondents involved in the study were from the geriatric population which is the target participants of this quasi-experimental study. The researchers found that when technology is perceived as useful and easy to use, geriatric patients are more likely to engage with it, especially when it supports independent living and improves health outcomes (Fox & Connolly, 2018). Older adults are often perceived to have barriers to using technology; however, the integration of simple, user-friendly mobile apps can enhance their ability to self-monitor and manage chronic conditions like hypertension.

The socio-economic profile of the respondents shows that the majority of the respondents belong to the low-income to middle-income status of the community. This suggests that financial limitations may influence their access to healthcare services and resources. Understanding their SES is essential in assessing how economic factors may impact their health outcomes and overall well-being. The type of patient profile of the respondents shows that the majority or 25 (83.33%) are out-patients while only 5 (16.67%) patients are in-patients. In this study, in-patient refers to the patients who stay in the

hospital for at least one night or longer and were admitted because they need more intensive or continuous care. In various studies, authors highlight the lack of resources that hampers the use of technology among financially challenged people and communities (English et al., 2014; Chib et al., 2015).

The profile of the patients/respondents shows that 100% of the respondents are hypertensive. However, in terms of comorbidities, 16 (53.33%) respondents have comorbidities while 14 (46.67%) have no comorbidities. In addition, the experimental group has more comorbidities patients than the control group. This difference in comorbidity distribution among the respondents may potentially influence the outcomes of the intervention, as individuals with multiple health conditions often require more complex management. Understanding the presence of comorbidities is crucial in evaluating the effectiveness of any treatment or intervention applied in the study. It also highlights the need for tailored approaches when addressing the health concerns of hypertensive patients with additional medical conditions.

Table 1

Comparative Summary of Results Between Control and Experimental Groups

Results	**Control Group**	**Experimental Group**
Section B Baseline Blood Pressure Average Baseline BP	134/91	158/105
Section C Patients' Knowledge (Mean Average Score)		
Pre-Test Mean Average	3.4	4.4
Post-Test Mean Average	3.46	4.53
Section D Awareness of BP Measurement and Management (Mean Average Score)	3.5	4.4
Section E. Knowledge of Lifestyle Modification (Mean Average Score)	3.8	4.4
Section F. Technology Acceptance (Mean Average Score)	3.8	4.3
Section G. Patient Adoption of HeartIn App (Mean Average Score)	3.3	4.3
Section H. Blood Pressure (15 days average)	131/92	127/86

The results of the study is presented on Table 1. Each section provides a comparison of the results between control and experimental groups. The table shows the summary of all the presentation of the results for control and experimental groups. The results presented showed that the experimental group had better results after the intervention – the HeartIn Mobile App had been employed. This is true to post test results (Section C), awareness of BP measurement (Section D), knowledge of lifestyle modification (Section E), HeartIn Mobile App acceptance (Section F), patients actual adoption of the technology (Section G), and the improvement of the heart rate of patients in a 15-day average (Section H). Each section provides a more detailed explanation of each result with findings and interpretations.

Baseline Blood Pressure. The baseline blood pressure (BP) of the respondents as soon as they enter the hospital whether they are in-patient or out-patient shows that the control group has a baseline BP of 134/91 while the experimental group has a baseline BP of 158/105. This indicates that the experimental group started with more elevated blood pressure levels compared to the control group.

The difference in baseline readings may reflect variations in the severity of hypertension among the two groups. It is important to consider this disparity when analyzing the effectiveness of the intervention, as initial BP levels could influence the rate and extent of improvement. Furthermore, this highlights the need for close monitoring and individualized care plans based on each patient's condition at the time of admission. As noted by Wu et al. (2015), patients with higher baseline BP tend to exhibit greater initial reductions in response to treatment, partly due to the body's compensatory mechanisms and the urgency of intervention. However, elevated starting levels also indicate greater cardiovascular risk, and thus, these patients require more intensive monitoring and management.

Patients' Knowledge. The patients' knowledge related to hypertension management was assessed from the responses of the 30 respondents. The findings revealed that participants demonstrated a relatively good understanding of hypertension, with a mean score of 3.90 and a standard deviation (SD) of 0.53. This suggests that, on average, patients had a sound grasp of what hypertension is, although there was some moderate variability in their responses. In addition, this study also aligns with the findings by Kassavou et al. (2022) highlighting that mHealth apps help increase adherence to medication, follow-up check-ups, and medication tracking. Thus, improving lifestyle fitted for hypertension management.

After the intervention, the control group's score rose slightly from 3.4 to 3.46, maintaining a "moderate" level. In contrast, the experimental group improved from 4.4 to 4.53, solidifying its position in the "good" category. The results of the independent samples t-test showed a statistically significant improvement in the experimental group's knowledge ($t(28) = -13.431$, $p < .001$), with a mean difference of 1.1467 and a confidence interval of [-1.3215, -0.9718]. This improvement validates the effectiveness of the HeartIn mobile app in reinforcing patient education. The app likely functioned as a daily

prompt for learning and application, making information more accessible and memorable. This outcome supports the claims of Gell et al. (2015), who found that mobile health interventions significantly improved disease-related knowledge and engagement among older adults when the interface was simple, relevant, and consistent.

The researcher used a 15-item questionnaire to determine the patients' understanding of hypertension and how it can be managed. To interpret the responses, the scores were analyzed using a descriptive interpretation table which categorizes knowledge into five levels - Very Low, Low, Moderate, Good, and Excellent. Each level corresponds to a range of scores reflecting the patient's comprehension of hypertension-related information.

Table 2

Post-Test and Pre-Test Test of Difference

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
V3	Equal variances assumed	.000	1.000	-14.436	28	.000	-.9733	.0674	-1.1114	-.8352
	Equal variances not assumed			-14.436	27.805	.000	-.9733	.0674	-1.1115	-.8352
V4	Equal variances assumed	.721	.403	-13.431	28	.000	-1.1467	.0854	-1.3215	-.9718
	Equal variances not assumed			-13.431	26.937	.000	-1.1467	.0854	-1.3219	-.9715

Based on the data provided on Table 2, the mean of the knowledge level among the patients before the conduct of the study (Pre-test) was found to be 3.9 which corresponds to a moderate level of knowledge. There is, however, a difference in the pre-test of the control group with a level of 3.4 described as moderate level knowledge while the experimental group is 4.4 described as good knowledge. The pre-test results reveal meaningful differences in the baseline knowledge levels between the control and experimental groups. The overall mean score of 3.9 suggests that, before the study, most participants possessed a moderate level of knowledge regarding hypertension.

This indicates that while patients have some awareness of the condition, there are still notable gaps in their understanding—particularly in areas such as long-term management, preventive measures, and lifestyle modification. As Fox and Connolly (2018) suggest, patients who already possess higher digital or health literacy are more likely to benefit from and engage with digital health tools such as mobile applications. According to Nutbeam (2000), health literacy includes not just functional knowledge but also the ability to apply it in real-life decision-making. The variability in patient adoption observed here suggests that while many patients understand what they should do, barriers remain in consistently implementing healthy behaviors. In the study by Gonzales et al. (2018) in the Philippines, low and inconsistent internet in rural areas renders mobile health apps for education to be less effective.

The test of difference using an independent sample t-test between the control group and the experimental group showed that Levene's Test significance is 1.000 where there are equal variances assumed. The p-value is .000 indicating statistical significance, and the mean difference is -0.9733. In addition, the test also assumed a 95% confidence level. An independent samples t-test was conducted to compare the knowledge level of patients included in the study and compare-test knowledge scores between the experimental and control groups. The pre-test showed that there was a statistically significant difference in scores, $t(28) = -14.436$, $p < .001$. The experimental group scored significantly higher than the control group, with a mean difference of 0.9733. The 95% confidence interval for the mean difference ranged from -1.1114 to -0.8352, indicating a real and meaningful difference in initial knowledge levels between the groups.

The post-test showed that Levene's Test Sig. is 1.000 indicating equal variances assumed with a p-value of .000 indicating statistical significance. The mean difference is -0.9733 with a 95% confidence level. An independent samples t-test was also conducted to compare post-test scores between the two groups. The results showed a significant difference, $t(28) = -13.431$, $p < .001$. The experimental group again scored significantly higher than the control group, with a mean difference of 1.1467. The confidence interval [-1.3215, -0.9718] indicates that the improvement in knowledge due to the intervention was both statistically and practically significant.

Therefore, the use of an independent t-test to compare the pre-test and post-test scores of the control and experimental groups showed statistically significant differences. The experimental group already had a higher baseline (pre-test) knowledge than the control group. After the intervention, the difference widened even further, suggesting the intervention was effective in improving hypertension knowledge. The consistent significance ($p < .001$) and large mean differences indicate that the results are not only statistically significant but educationally meaningful. However, among rural communities, Mottini et al. (2021) and Lee et al. (2022) also highlighted pointing out that digital literacy is a significant barrier in rural communities.

Awareness of BP Measurement and Management. The awareness of the patients on BP Measurement and Management was measured using an awareness test measured by very aware, aware, neutral, not aware, and not at all aware. The sample size (N) is 30 participants and the results showed that the mean score is 4.16 and a standard deviation of 0.3979. The mean score for BP awareness and management among the 30 participants was 4.16 on a 5-point Likert scale. This high average score indicates that participants generally agree or strongly agree with statements related to being aware of

their blood pressure status and actively managing it. The relatively low standard deviation (0.398) suggests that responses were closely clustered around the mean, showing consistent awareness and management behavior across the sample.

There is however a slight difference between the control group and the experimental group in terms of their respective knowledge on BP measurement. The control group has a mean score average of 3.5 while the experimental group has a mean score average of 4.4. The control group, which did not receive any special intervention or treatment, has a mean score of 3.5. This suggests that their knowledge about BP measurement is moderate on the scale used (1–5 in Likert scales).

The difference in mean scores (4.4 vs. 3.5) shows that the experimental group has improved or higher knowledge as a result of the intervention. However, the "slight difference" is not statistically significant when tested using t-test. This is maybe due to the small sample size used in this study. Nevertheless, the observed difference suggests that the intervention had a positive impact on the experimental group's knowledge of BP measurement. The statement implies that educational interventions or health programs can lead to improved awareness or knowledge in specific health-related topics like blood pressure measurement, as seen in the higher average score of the experimental group. These findings are in line with previous studies, such as Huang et al. (2013), who reported that patient awareness is a critical precursor to both treatment adherence and lifestyle modification in hypertension control. Moreover, Zhao et al. (2019) found that older adults who are regularly informed and aware of their BP levels tend to participate more actively in self-care behaviors, especially when supported by accessible tools such as mobile apps or regular health counseling.

Knowledge of Lifestyle Modification. The quantitative survey related to knowledge of lifestyle modification is the patients' knowledge of the need for lifestyle modification to improve hypertensive condition including diet, reduction of sodium intake, and engagement in physical activities such as exercise or physical activities. The results of the study showed an average score for overall knowledge of lifestyle modification (KLM) is 3.90 with a standard deviation (SD) of 0.527, which is considered good. The low standard deviation suggests consistent responses among patients, indicating that most participants have a similar and reasonably good understanding of the lifestyle changes needed to manage hypertension.

More specifically, the need for diet has a mean of 4.29 and an SD of .864. Awareness on the management of BP has a mean of 4.23 with an SD of .497. Both were rated high with the highest mean scores, showing that patients are well aware of the need for healthy dietary habits like low fat, more fruits and vegetables, and the importance of actively managing blood pressure to prevent complications. The indicator of the awareness of the need for lifestyle modification has a mean of 3.71 and an SD of .864 which reflects a general awareness of lifestyle change but is lower than the diet and BP management aspects. The indicator reduced sodium intake has a mean of 3.58 and a standard deviation of .765. Finally, the need for exercise has a mean of 3.55 with an SD of .675 showing moderate levels of knowledge. These slightly lower scores may suggest a lack of detailed understanding of how or why reducing sodium and increasing physical activity helps control hypertension, potential areas for targeted education, or reinforcement in health programs.

The findings suggest that most hypertensive patients are aware that lifestyle modification is important for blood pressure control. However, knowledge is stronger in general and dietary aspects, while more specific behaviors like sodium reduction and regular exercise are less emphasized or understood. These results can inform healthcare providers and educators to focus more on practical guidance around physical activity and salt reduction strategies during health education sessions. Moreover, knowledge may not be sufficient as pointed out by Artinian et al. (2010) indicating that behavioral reinforcement, counseling, and support systems are likewise critical for sustained lifestyle change. This is a promising result, especially given the age group of the participants, as older adults often face additional barriers to health literacy and behavioral change due to physical limitations, cognitive decline, or lack of access to consistent health education. In the study by Lee et al. (2022), the authors opined that digital literacy is a significant barrier, especially in rural communities.

Technology Acceptance. This study used the HeartIn Mobile Application as an intervention program for the experimental group. At the onset, since this is a study on geriatric patients, where the characteristics of the respondents on technology use which is true among elderly Filipinos is gradually increasing, particularly with the support of family members or caregivers (Abalos et al. 2024). Smartphone penetration is growing, especially in urban areas, but digital literacy remains a barrier for many. It was found that older adults are more likely to use technology if it is simple and intuitive, provides clear health benefits, and is recommended by healthcare providers. The integration of technology when fully exploited creates value among organizations (Sy, 2025).

Technology acceptance showed the Perceived Usefulness (PU) of technology has a mean score of 3.94 and a standard deviation of .4073 which is relatively high indicating that the geriatric patients find the technology useful for managing hypertension. In addition, the Perceived Ease of Use (PEOU) has a mean score of 4.16 and a standard deviation of .3979. The higher mean suggests that geriatric patients find the HeartIn App easy to use. Finally, the total mean score of Technology Acceptance is 4.05 with a standard deviation of .3607 which suggests consensus among participants that they generally feel similarly about the usefulness and ease of use of the system.

These findings align with previous studies, such as Chobanian et al. (2003) and James et al. (2014), which emphasized that lifestyle modification, particularly diet, and BP self-monitoring, can significantly reduce hypertension-related risks and are often the first aspects addressed in hypertension education programs.

Patient Adoption of HeartIn Mobile App. The adoption of the HeartIn Mobile App among patients to manage hypertension—can be evaluated by assessing their willingness and usage behavior. These dimensions often reflect how well a digital health tool is accepted and integrated into daily health management practices. The results show that the overall mean for patient adoption is 3.79 with a standard deviation of .5823 indicating a generally good level of adoption of the HeartIn App. The standard deviation of 0.5823 suggests a fairly consistent level of agreement among patients.

In terms of comfort in the use of the HeartIn App, the mean score is 4.03 with a standard deviation of 0.320. This is the highest-scored indicator, with low variability, showing that most patients feel very comfortable using the app. This is especially important in a geriatric population where digital literacy can be a barrier. This supports findings from Venkatesh et al. (2003) in the Technology Acceptance Model (TAM), which posits that perceived usefulness is a key predictor of user behavior and technology adoption.

There is a difference between patient adoption between control and experimental groups. The mean average score for the control group is 3.3 while the mean average score for the experimental group is 4.3. The results suggest that the HeartIn Mobile App is well-received by patients, particularly in terms of ease of use, comfort, and motivation. It is however more adopted by the experimental group. Educational reinforcement, user support especially for geriatric patients, and features like daily reminders or integration with medical appointments which are the major features of HeartIn Mobile App helped improve daily engagement. Since patients are generally motivated and intend to keep using it, this shows potential for long-term adoption, especially if initial barriers are addressed. This supports previous findings by Fox and Connolly (2018), which emphasized that older adults are more likely to adopt health technology when it is designed to be simple, intuitive, and relevant to their needs. Similarly, Mitzner et al. (2010) noted that while older adults are capable of using technology, habit formation, and environmental support are essential for sustained use.

Blood Pressure. The baseline and the last taking of BP data of the respondents grouped as control and experimental groups. The data at baseline showed that the control group had an average BP of 134/91 and the experimental group 158/105. All patients in the experimental group have BP beyond 120/80 while the control group has 4 patients with normal BP at baseline and still complaining of symptoms of hypertension such as headaches and body aches. The last BP was taken on the 15th day, and the data showed that the average BP of the control group was 131/92 on the one hand. This highlights that symptom experience and clinical measurements may not always align, especially among older adults who may misinterpret or underreport symptoms, as discussed in the study by Kearney et al. (2005).

On the other hand, the BP of the experimental group is 127/86 indicating a stark drop from the baseline BP. Table 13 provides a comparison between the control group and experimental group taken during baseline taking and the last take after 15 days. The result of the data showed that the Levene's Test Sig. is 0.357 indicating equal variances are assumed, while the t-value is -1.898, the degrees of freedom (df) is 58, and the test of significance using a 2-tailed test is 0.063. In addition, the mean difference is -14.10 with a 95% confidence level. As supported by Whelton et al. (2018), even modest reductions in BP (as small as 5–10 mmHg systolic) are associated with substantial decreases in cardiovascular risk. The findings thus suggest that the HeartIn app, through continuous self-monitoring, increased awareness, and motivational support, may have contributed to improved self-regulation and adherence to lifestyle changes within the experimental group. The lack of a significant between-group effect might also reflect factors specific to the geriatric population, such as first-time exposure to health technology, potential difficulty forming new digital habits, and variability in support from caregivers or family members. As Fox and Connolly (2018) note, technology adoption among older adults is highly influenced by perceived benefits, ease of use, and the presence of a supportive environment.

While the intervention did not yield a statistically significant group-level difference, the BP reduction within the experimental group demonstrates the potential clinical value of mHealth tools like the HeartIn app. These results underscore the importance of longer intervention periods, personalized user guidance, and reinforcement strategies to enhance the impact of digital tools in managing chronic conditions among the elderly. The findings further suggest that future studies should account for baseline BP disparities, potentially using ANCOVA or longitudinal designs to control for initial differences.

Table 3

Blood Pressure Comparative

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Baseline	Equal variances assumed	.863	.357	-1.898	58	.063	-14.100	7.428	-28.969	.769
	Equal variances not assumed			-1.898	54.069	.063	-14.100	7.428	-28.992	.792
M29	Equal variances assumed	.809	.372	-.834	58	.408	-5.49777778	6.595144685	-18.6993942	7.703838649
	Equal variances not assumed			-.834	56.220	.408	-5.49777778	6.595144685	-18.7082982	7.712742612

Table 3 shows that the p-value of 0.063 is slightly above the conventional significance level of 0.05. This means there is no statistically significant difference between the two groups' baseline scores, although the result is very close to being significant. The mean difference of -14.1 suggests the experimental group may have had lower baseline values than the control group, but this difference could be due to more chance. The confidence interval includes 0 (from -28.969 to 0.769), confirming the non-significance. Although there is a noticeable difference in mean baseline scores (-14.1), the result is not statistically significant (p = .063). This suggests the two groups were relatively comparable at baseline, which is ideal for intervention studies.

In terms of the blood pressure taken during the 15th day (last day), the data shows that Levene's Test Sig. is 0.372 indicating equal variances assumed. The t-value is -0.834, the degrees of freedom (df) is 58, and the sig. (2-tailed) 0.408, and the mean difference is -5.50 at a 95% confidence level. The p-value which is 0.408 indicates it is not statistically significant. The mean difference of -5.50 shows a small numerical difference, but again, it could be due to random variation. The confidence interval includes 0, reinforcing the conclusion of no significant difference between groups at this time point.

There was no significant difference in scores between the control and experimental groups at the M29 time point (p = .408). The intervention did not lead to a statistically significant change between groups by this measurement period.

Malaysian Medication Adherence Scale (MALMAS). The Malaysian Medication Adherence Scale (MALMAS) (Chung et al., 2015) is a validated tool used to measure medication adherence among patients with chronic conditions, especially hypertension. It is based on the 8-item Morisky Medication Adherence Scale (MMAS-8) but was adapted and validated for use in Malaysia. However, it is now also used in various Southeast Asian contexts, including the Philippines, due to its simplicity and reliability in evaluating patient behavior. For patients with hypertension, medication adherence is critical to maintaining controlled blood pressure and avoiding complications like stroke or heart disease. MALMAS helps assess how consistently and correctly patients are taking their antihypertensive medications.

Table 4

MALMAS

	N	Minimum	Maximum	Mean	Std. Deviation
ChangeSUM	30	3.33	4.83	4.1111	.42058
DESUM	30	3.00	4.67	4.0000	.50287
GMSUM	30	3.00	5.00	4.0222	.59328
MALMAS	30	3.22	4.72	4.0444	.46582
Valid N (listwise)	30				

Table 4 shows the three factors of MALMAS including Current Diet and Exercise, Readiness to Change, and Goals and Motivation. In terms of Current Diet and Exercise, the patients indicated that the mean score is 4.00 and a standard deviation of .50287. This indicates that patients have a good understanding and engagement in the non-pharmacological management of hypertension. High scores imply that they recognize the role of healthy eating and regular physical activity in controlling blood pressure. This is encouraging because lifestyle modification is a first-line recommendation in hypertension care. Patients recognize the role of healthy eating habits, sodium reduction, and physical activity in maintaining cardiovascular health. These findings are consistent with Artinian et al. (2010), who emphasized that lifestyle changes, alongside medication, are first-line strategies in hypertension care.

In terms of the Readiness to Change among hypertensive geriatric patients, the mean score is 4.11 and a standard deviation of .40258 which is the highest score. The highest score suggests patients are mentally and emotionally prepared to make or continue healthy changes. It reflects positive behavioral intent, which is often a strong predictor of successful long-term health outcomes. In terms of Patients' goals and motivations, the mean score is 4.022 and a standard deviation of .59328 indicating that the patients have clear goals for managing their condition and are intrinsically motivated. Motivation is critical for maintaining both medication adherence and lifestyle changes. The slightly higher standard deviation here (SD = 0.593) suggests some variation—some patients are more motivated than others.

A high total MALMAS average with a mean score of 4.044 and a standard deviation of .46582 indicates that most patients adhere well to their medication regimen. Since medication adherence is essential in hypertension control, this result suggests patients are actively managing their condition as prescribed. The consistent standard deviation supports reliability across the group. These results are significant in light of data from the World Health Organization (2003), which estimates that only about 50% of patients with chronic diseases in developed countries adhere to their long-term therapies. The higher adherence seen in this study may be attributed to intervention support in the HeartIn App, ongoing education, or structured routines among older adults.

Effect Size of the Use of HeartIn Mobile App. Cohen's d measurement is a measure of how much more effective the intervention was in promoting patient adoption in the experimental group compared to the control group. This study, it is measuring the use of the HeartIn Mobile App as an intervention among hypertension patients among patients in the experimental group. Table 5 shows the result of the Effect size using Cohen’s d. The result of the study showed that the Cohen’s d coefficient is 7.90. This is an extremely large effect size, suggesting a very strong difference in Patient Adoption (PK) between the two groups. Cohen's d value of 7.90 indicates a very large and highly meaningful effect of the intervention on patient adoption of the HeartIn app. This suggests that, after the intervention, patients significantly increased their engagement, comfort, and willingness to continue using the app. The improvement is not only statistically significant but practically significant with a substantial impact on behavior.

Table 5

Cohen's d Measurement

Group	N	Mean (₱K)	Standard Deviatio	Effect Size
Pre-intervention	15	3.47	0.14	
Post-intervention	15	4.37	0.08	
Cohen's d				7.9

A comparison of patient adoption scores between the control group with a mean score of 3.47 and a standard deviation of 0.14 while the experimental group has a mean of 4.37 and a standard deviation of 0.08 shows a substantial difference. The calculated Cohen's d of 7.90 indicates a very large effect size, suggesting that the intervention significantly improved patient adoption of the HeartIn Mobile App. This finding aligns with previous work by Venkatesh et al. (2003) on the Technology Acceptance Model (TAM), which emphasizes that both perceived usefulness and ease of use drive technology adoption. The earlier sections of this study already showed high levels of perceived usefulness and ease of use, which are now confirmed to have translated into actual behavior change, as measured by the effect size. Additionally, this very large effect supports the idea that mHealth tools can be powerful drivers of behavioral change in geriatric populations—especially when the technology is appropriately designed and supported. According to Fox and Connolly (2018), older adults are more likely to adopt and benefit from digital tools when the interface is intuitive and the health benefits are clear. The HeartIn app appears to meet these criteria successfully, as demonstrated by the extraordinarily high effect size.

Theory Confirmation/Disconfirmation. The results of the study showed that the mean score for PU was 3.94, indicating that the majority of participants found that the HeartIn Mobile App is helpful in managing their hypertension. This is consistent with TAM's prediction that perceived usefulness is a primary driver of user acceptance. For older adults, understanding that a technology can improve their health or simplify disease management significantly increases their likelihood of using it. The score of 3.94 however also indicates that some patients may have challenges in adopting the technology. In rural settings where internet connectivity is a challenge, some patients especially outpatient respondents may be challenged with low and inconsistent internet connection. In a study by Lee et al. (2022), the authors confirmed that digital literacy is a significant barrier among people from rural communities while Nguyen and Hoang (2023) found that the lack of understanding of the features of a technology's features and privacy policies is a major obstacle to adoption.

Conclusion. This study assessed the effectiveness of the HeartIn mobile health application in supporting hypertension management among geriatric patients. Using a combination of statistical methods—including independent sample t-tests, regression analysis, and effect size calculations—the results offer a comprehensive understanding of how digital tools can influence knowledge, behavior, and clinical outcomes among elderly individuals.

In terms of patient knowledge, the experimental group showed a statistically significant improvement post-intervention. The researcher concludes that the HeartIn app is a tool that plays an effective role in educational and patient engagement. The increase in knowledge particularly in areas of lifestyle modification and hypertension self-management demonstrates the app's utility as a continuous learning companion. However, the observed knowledge gaps in sodium reduction and exercise suggest that future iterations should include more behavior-specific content.

Regarding technology acceptance, the study concludes that geriatric patients are open to using health technologies when they are simple, useful, and relevant. This is evidenced by high mean scores in Perceived Usefulness and Ease of Use, supported by a very large effect size of Cohen's d coefficient, indicating a strong and consistent perception of the app's value. These results align with the Technology Acceptance Model (TAM), which posits that usefulness and ease of use are critical drivers of technology adoption.

In terms of regression analysis, the study concludes that patient adoption of the HeartIn app can be explained by the five predictors included in the model. The F-statistic was also significant confirming the overall strength and reliability of the regression model. Of the five predictors, Patient Knowledge (PKNOWAVE) emerged as the strongest and most statistically significant predictor of app adoption. This finding underscores the crucial role of health literacy in digital health engagement because knowledge is a gateway to behavior change, especially in older populations. Interestingly, Knowledge of Lifestyle Modification (KLIFEAVE) was also statistically significant but showed a negative association, suggesting that patients already confident in managing their lifestyle may perceive less added value in using the app—possibly a reflection of a "knowledge sufficiency" effect.

In terms of the Technology Acceptance Model variables—Perceived Usefulness (PUAVE) and Ease of Use (PEOUAVE), the study concludes that these are not significant predictors of HeartIn Mobile App Adoption. This suggests that, in this population, clinical knowledge and informational readiness may outweigh perceptions of usability in determining actual app adoption behavior. Additionally, Blood Pressure Level (UHYAVE) had no significant effect, indicating that baseline clinical severity did not influence patients' likelihood to adopt the tool. The validity of the results supported by diagnostic checks of the Durbin-Watson statistic, independence of residuals, and the Breusch-Pagan test which showed that the assumption of homoscedasticity was satisfied; and Q-Q and P-P plots indicated that residuals were normally distributed. These confirm that the four assumptions of regression were met, validating the robustness and generalizability of the model.

While the experimental group showed a clinically meaningful decrease in blood pressure, the difference compared to the control group was not statistically significant. This study also concludes that the intervention may have contributed to better self-management but was not sufficient, within the short study duration, to yield statistically verifiable physiological changes. A longer intervention period or a larger sample size is recommended to assess long-term effects more accurately.

In terms of medication adherence, results from the Malaysian Medication Adherence Scale (MALMAS) revealed high levels of engagement, especially in readiness to change and motivation. This further supports the role of mHealth tools like HeartIn in promoting consistent self-care behavior in older adults.

Finally, while patients reported high comfort and motivation in using the app at, a lower frequency of use, the researcher concludes that short-term interventions may not fully capture long-term behavioral adoption. Sustained usage likely depends on continued reinforcement, personalized reminders, and caregiver support.

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