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A Critical Examination of The Effectiveness of Persuasive Technology in Reducing Hypertension Crisis in Developing Nation

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Abstract
Hypertension, a leading global health challenge, is a silent but preventable condition that significantly increases the risk of heart disease, stroke, kidney failure, and premature death. Despite the availability of affordable and effective treatment options, control rates remain alarmingly low, especially in low and middle income countries such as Nigeria, where poor health-seeking behaviors and inadequate adherence to medical advice persist. This study examined the role of persuasive technology in influencing behavioral change among adults toward hypertension prevention and management. Using a descriptive survey research design, data were collected through a 12-item, 5-point Likert scale questionnaire administered to 231 respondents via online platforms. The instrument demonstrated strong reliability (Cronbach's Alpha = 0.814). Data were analyzed using descriptive statistics and one-sample t-tests. Findings revealed that while many individuals monitor blood pressure only during illness or hospital visits, proactive home-based monitoring remains inconsistent. Results also indicated strong consensus on the effectiveness of persuasive technology in motivating users, enhancing adherence to medical guidance, providing tailored health education, and offering emergency alerts. Statistical tests confirmed significant support for the necessity of regular blood pressure monitoring and the effectiveness of persuasive technology in promoting behavioral change ($p < .001$). The study concludes that integrating persuasive technology, particularly mobile applications, into hypertension management strategies can improve awareness, compliance, and overall health outcomes among adults. It recommends leveraging artificial intelligence driven persuasive tools to foster sustained behavioral change, thereby reducing the burden of hypertension related complications.

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I. Introduction

Hypertension which is popularly called 'high blood pressure' is a serious medical condition that significantly increases the risk of diseases of the heart, brain, kidneys and other organs. WHO, 2021 estimated 1.4 billion people worldwide that have been diagnosed of high blood pressure, but only 14% have it under control, even though there are many available cost-effective treatment options. The literal interpretation of this assertion is that 86% of the population do not have it under control probably as a result of their inability to detect that they are victim of such condition or their inability to religiously keep all the medical advice given to them.

Hypertension which has high tendency of causing sudden death and heart attack, stroke, vascular dementia, eyes problem and kidney diseases can be described as a silent killer that does not give any warning sign to alert the patient, and it can only be detected through regular health checkup. WHO, 2023 discovers that the higher the blood pressure of an individual, the greater the chance of having myocardial infarction, stroke, heart failure, or kidney disease. For people between the age of 40 years and 70 years, the risk of cardiovascular disease doubles with each increment of 20 mmHg in systolic blood pressure or 10 mmHg in diastolic blood pressure. NIH, 2022 maintains that possibility of having high blood pressure is direct proportion to increase in age of the patient and presents a long term research report which shows that treating high blood pressure was associated with a reduction in the risk of developing hypertension complication. According to Ordinioha (2013), hypertension and other non-communicable diseases (NCD) are currently responsible for at least 20% of all deaths in Nigeria, and form up to 60% of the patients that are admitted into the medical wards of most tertiary hospitals in Nigeria. These alarming data is clear revelation of the need for a serious emphasis on public awareness on the gravity of high blood pressure and for an aggressive proactive approach to antihypertensive treatment. Owing to various available antihypertensive drugs with the appropriate drug combination strategies,

the blood pressure (BP) of many hypertensive patients can be controlled (Kim and Shin, 2023). This assertion which has been confirmed by many other researchers, point to the fact that treatment of hypertension is never a problem because the medicines are available and affordable. If the principle of elimination method in troubleshooting is employed, the annual increase in the percentage of hypertensive patients can then be attributed to the problem of early detection of the condition by the victim and faithfulness of the victim to following up the treatment as prescribed by medical practitioner. Even though Kario *et al*, 2021 opines that wide variety of external factors such as environmental factor like temperature, psychological stress, physical exercise etc., can trigger the high blood pressure, the fact still remains that hypertension can be controlled if it is discovered on time and if the persons involve observe the do's and don'ts for the control. Since High blood pressure often has no signs or symptoms that can be used to detect it immediately, there is need for regular checks of blood pressure to ensure early detection of the case of hypertension. Konstantinidis *et al*, 2022, argue that both scientific community and industry have shown serious interest in designing small, wearable devices to measure blood pressure effectively and there has been a great success in the digital device development process. These devices function using a variety of different approaches and technologies to monitor BP, and some of them have already been clinically certified (Kario, 2020). This development shows that there are many devices that can be used to measure blood pressure effectively. Some of these devices are made for hospital use while others are made to be used at home or in the office for proper monitoring of blood pressure which further suggest that lack of equipment to measure or monitor blood pressure may not be among the major factors that enhance the growth of hypertension cases among the young adult. In most hospital or health center, temperature, blood pressure and pulse are seen as vital signs that must be measured before attending to patients; therefore, regular checkup of one's health can help discover any cases of high blood pressure in good time. Islam et al (2022) argue that despite significant advancements experienced in healthcare and the availability of low-cost, effective therapies, overall progress in hypertension control has been slow as a result of large number of undiagnosed cases of high Blood Pressure and lack of regular BP assessment over time. A study conducted by Njoku, et al, (2024), shows that majority of people (86.6% of the respondents) have heard about the need for periodic blood pressure check from radio or television programmes in one way or the other and yet they did nothing about it. On the other hand, the number of respondents that are not aware of such media messages are low (about 13.4% of the total respondents). A close attention should be paid to the problem of numerous undiagnosed high Blood Pressure cases and poor attitude of many people to regular BP assessment before a significant reduction in the cases of hypertension crisis can be achieved. One effective way of solving such problem is to create serious awareness of the consequences of untreated hypertension and to put in place a modality for regular BP measurement for every adult. In this era of mobile technology, smart phone can be employed in creating the aggressive awareness since larger percentages of the people in the world are using it. A good application that is persuasive in nature may do the magic. The new trend of artificial intelligent has significantly improved effectiveness of persuasive technology. Persuasive Technology can be described as modern technologies that are designed for changing the attitudes or behaviors of the users through persuasion and social influence without any usage of force. Hussian *et al* (2023), believes that Mobile applications are very effective and efficient tools that promote good health, better attitudes, and good behavior in their users. This has been proved to work effectively in trading, negotiation, politics, religion, military training, public health, management, and other numerous areas of human interaction with his environments. This paper preaches the use of persuasive technology with the help mobile application to change the narrative of poor attitude of adult not knowing their health status and at the same time ensure compliance to doctor's prescription.

II. Research Questions

The following research questions guided the study to avoid distraction from the focus of the study:

1. What human behaviors towards blood pressure monitoring require change in order to reduce hypertension among young adult
2. How effective is persuasive technology in promoting behavioral change among hypertensive young adult

Hypothesis

$H1_0$ – it is not necessary to form the habit of checking blood pressure regularly for the prevention and management of Hypertension

$H1_1$ – it is very necessary to form the habit of checking blood pressure regularly for the prevention and management of Hypertension

$H2_0$ – Human behaviour does not influence hypertension among young adult.

$H2_1$ - Human behaviour influences hypertension among young adult

III. Review of related literatures

Orji and Moffatt (2018) observe that out of 85 research study reviewed on the effectiveness of persuasive technology in health behavioral change, up to 75% of research papers reported that the use of Persuasive Technology has significant effect on the specified health behavior. 17% of the research studies reported that persuasive technology has partial effect on behavioral change. It was only 8% of all research studies reviewed that reported negative outcome by showing that persuasive technology has no effect on behavioral change. Pintar (2021), sees Persuasive technology as a very effective tools that can be employed to ensure behavioral change. To maximize the effectiveness of persuasive technology in behavior change system, Pintar designed a framework that integrate trans-theoretical model stages of change with a suitable persuasive technology features and subjected it to experimental study which yielded a positive result. A study conducted by Bartholomew *et al* (2019) reveals that for an individual to change any behavior, the promoted behaviors should illustrate his/her tangible gains, incentives provision, increasing of behavior's social status, time efficiency, social acceptability, easier to practice and cheap. Persuasive technology should be able to play this role effectively since it has been proved to be effective in educating, instructing and inspiring. One of the most widely used models in persuasive technology is Fogg's Behavior Model (FBM), which asserts that behavior change occurs when three elements are present simultaneously: motivation, ability, and triggers (Fogg, 2021). According to FBM, a person will only engage in a behavior if they are motivated to do so, have the ability to perform the behavior, and encounter a trigger that prompts action. This model has been applied in the design of persuasive health applications that encourage patients to take their medications regularly, adopt healthier diets, and engage in physical activity.

The Elaboration Likelihood Model (ELM) is another important framework in persuasive technology. ELM explains how individuals process and adopt persuasive messages based on their level of involvement and motivation (Petty & Cacioppo, 2022). In the context of hypertension monitoring, the ELM can help developers design interventions that are more likely to resonate with patients, depending on their motivation and engagement level. For instance, patients with a high level of involvement in their health may be more likely to respond to detailed, evidence-based health recommendations, while those with lower involvement may require more straightforward and visually appealing interventions.

The Self-Determination Theory (SDT) emphasizes the role of intrinsic motivation in sustaining long-term behavior change (Deci & Ryan, 2022). SDT suggests that individuals are more likely to engage in health behaviors when they feel a sense of autonomy, competence, and relatedness. In the context of hypertension management, persuasive technologies can leverage SDT by providing patients with tools that help them feel in control of their health, such as personalized health goals and progress tracking.

By integrating these theoretical frameworks into the design of persuasive technology solutions, developers can create more effective digital interventions that motivate patients to adhere to hypertension management strategies. These frameworks provide valuable insights into how to engage users, promote lasting behavior change, and improve overall health outcomes. The center of attraction in this paper is to test the effectiveness of using persuasive technology in reducing hypertension crisis among young adults.

IV. Materials and Method

This study utilized a descriptive survey research design. A 5-point Likert scale questionnaire with 12 items, derived from two research questions, was administered using Google form and shared through various social medial platforms such as Whatsapp, Facebook and individual email. Two hundred and thirty one (231) respondents filled the form from different part of Nigeria and beyond. The instrument's reliability was tested using the Test-Retest method, yielding a Cronbach's Alpha value of 0.814, which confirmed its reliability. Two experts validated the questionnaire to ensure it met quality standards. Data analysis was performed using SPSS to compute mean and standard deviation of responses for each item. A mean score of 3.00 or higher (based on a 5-point scale) was used as the basis for decision rule, where mean scores above 3.00 were considered for acceptance as reflection of the statement, otherwise rejection of the assertion is considered suitable. One-Sample T-Test was performed on the relevant data to determine the justification for the rejection or acceptance of null hypotheses. Related literatures were used to substantiate the findings.

V. Results and Discussions

Age group of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than or equal to 40	69	29.9	30.4	30.4
	41-50	70	30.3	30.8	61.2

	51-60	54	23.4	23.8	85.0
	61-70	25	10.8	11.0	96.0
	Greater than 70	9	3.9	4.0	100.0
	Total	227	98.3	100.0	
Missing	System	4	1.7		
Total		231	100.0		

Table 1: Age group of the respondents

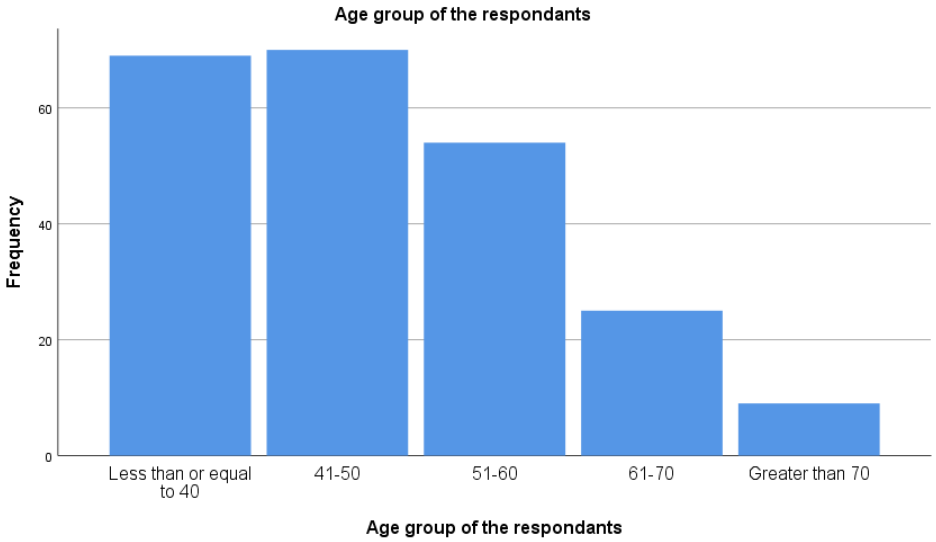

Figure 1: Bar Chart showing the Age group of respondents

Gender of the respondents					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	122	52.8	53.3	53.3
	Female	107	46.3	46.7	100.0
	Total	229	99.1	100.0	
Missing	System	2	.9		
Total		231	100.0		

Table 2: Gender of the respondents

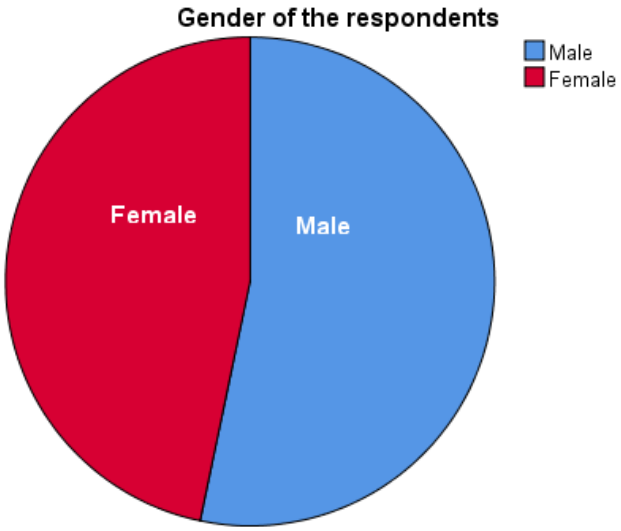

Figure 2: Pie Chart showing the gender of the respondents

Research Question 1: What human behaviors towards blood pressure monitoring require change in order to reduce hypertension among young adult

3	What is the level of your agreement to the peculiarity of the following to your life	N	MEAN	STD. Deviation	Decision
I	I only check my BP when I am sick	212	3.52	1.252	Accepted
Ii	I use to check my BP regularly whenever I visit hospital	213	4.08	1.074	Accepted
Iii	I have never check my BP because I have not been to any hospital for treatment before	203	2.33	1.252	Reject
Iv	I have BP measuring device at home but I hardly check my BP	216	3.05	1.427	Accepted
V	I have BP Measuring device at home and I use it regularly	213	3.10	1.363	Accepted

Table 3: The attitude of people towards checking their blood pressure

Table 3 presents respondents' level of agreement with statements related to their blood pressure (BP) monitoring practices. The findings reveal mixed patterns of behavior that highlight both positive and negative tendencies in hypertension self-care. A substantial proportion of respondents agreed with the statement *"I only check my BP when I am sick"* (M = 3.52, SD = 1.252), which was accepted. This suggests that many individuals tend to monitor their BP reactively rather than proactively. Such behavior aligns with earlier findings indicating that patients in many low- and middle-income settings often seek healthcare only when symptomatic, which may delay the detection of hypertension or related complications (Oladepo et al., 2020).

Conversely, respondents reported higher agreement with the statement *"I use to check my BP regularly whenever I visit hospital"* (M = 4.08, SD = 1.074). This was also accepted and represents the most positively rated item in the table. It indicates that hospital visits remain a critical context for routine BP monitoring. This is consistent with the observations of Ogedegbe et al. (2021), who noted that healthcare facilities serve as the primary touch point for hypertension screening and monitoring in many populations.

Interestingly, the statement *"I have never checked my BP because I have not been to any hospital for treatment before"* received the lowest mean score (M = 2.33, SD = 1.252) and was rejected. This is an encouraging outcome, as it suggests that the majority of respondents have at some point checked their BP, reflecting a relatively good level of awareness about the importance of hypertension screening. Prior studies have emphasized that early detection and regular monitoring are key to reducing the burden of hypertension and its complications (World Health Organization [WHO], 2021).

The findings on home-based BP monitoring present a more nuanced picture. Respondents moderately agreed with *"I have a BP measuring device at home but I hardly check my BP"* (M = 3.05, SD = 1.427) and *"I have a BP measuring device at home and I use it regularly"* (M = 3.10, SD = 1.363). Both were accepted, suggesting variability in home-monitoring behavior. While some individuals own devices but underutilize them, others use them more consistently. This aligns with the findings of Tucker et al. (2017), who reported that while home BP monitoring can significantly improve hypertension management, adherence to regular use often depends on patient motivation, education, and follow-up support.

Overall, the results reveal that although respondents recognize the importance of BP monitoring, many still adopt a reactive rather than preventive approach. Hospital visits remain the most common context for BP checks, while home monitoring practices are inconsistent. These findings highlight the need for targeted health education and supportive interventions to encourage regular self-monitoring, which has been shown to improve hypertension control and patient outcomes (Uhlig et al., 2013).

$H1_0$ – it is not necessary to form the habit of checking blood pressure regularly for the prevention and management of Hypertension

One-Sample Test						
	Test Value = 3					
					95% Confidence Interval of the Difference	
It is necessary to form the habit of checking blood pressure regularly for the prevention and management of Hypertension	t	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
	-7.681	202	.000	-.675	-.85	-.50

Table 4: One Sample T- test for Hypothesis 1

Respondents significantly disagreed with the statement *"I have never checked my BP because I have not been to any hospital for treatment before."* The mean response was significantly lower than the neutral value (3), indicating that on average, participants rejected this claim. In simple terms, most respondents have checked their BP even if they have not been to a hospital, showing awareness of blood pressure monitoring outside hospital visits. Therefore $H1_0$ is rejected while $H1_1$ is accepted meaning that it is very necessary to form the habit of checking blood pressure for the prevention and management of hypertension.

Research Question 2: How effective is persuasive technology in promoting behavioral change among hypertensive young adult

4	How effective do you think persuasive technology can be in performing the following functions	N	MEAN	STD. DEVIATION	DECISION
I	Motivating users to take good care of themselves	229	4.52	.698	ACCEPTED
Ii	Following up users to ensure compliance with the condition for healthy living	226	4.42	.803	ACCEPTED
Iii	Educate and Instruct the user with healthy living tips	226	4.47	.700	ACCEPTED
Iv	Advising the user based on their medical records available	226	4.49	.688	ACCEPTED
V	Alert the medical personnel and close relation in a critical condition	228	4.27	.982	ACCEPTED

Table 5: People's perception on the effectiveness of Persuasive technology in behavioral change

The findings from this study provide clear evidence that persuasive technology is perceived as an effective tool for promoting healthy behaviors among hypertensive patients. As shown in Table 4, all of the identified functions of persuasive technology received mean scores well above the neutral midpoint of 3.0, ranging between 4.27 and 4.52. The relatively low standard deviations (0.688–0.982) indicate that the responses were consistent, suggesting strong consensus among participants. Based on these results, all the proposed functions of persuasive technology were accepted as effective.

Respondents strongly agreed that persuasive technology can motivate users to take good care of themselves (M = 4.52, SD = 0.698). This is supported by Wu et al. (2023), who demonstrated that mobile health applications significantly improved self-management and motivation among hypertensive patients. Following up users to ensure compliance with healthy living practices also received high support (M = 4.42, SD = 0.803). Similar evidence was reported by Zhang et al. (2023), who showed that remote monitoring combined with SMS follow-up significantly improved adherence and lifestyle compliance in hypertensive patients in rural China.

In addition, educating and instructing users with healthy living tips was rated highly (M = 4.47, SD = 0.700). Faruque et al. (2022) emphasized in a systematic review that educational features and tailored health feedback are critical to the success of mobile health interventions for hypertension management. Similarly, the function of advising users based on their available medical records was endorsed (M = 4.49, SD = 0.688). This finding aligns with research showing that personalization of health interventions using patient data is a key determinant of behavior change and long-term adherence (Spring et al., 2020). Finally, alerting medical personnel and close relatives in cases of critical conditions, though slightly lower than the other functions, was still strongly accepted (M = 4.27, SD = 0.982). Evidence from Kario et al. (2021) supports this finding, as digital health tools with real-time alert mechanisms have been shown to reduce delays in emergency care for hypertensive patients.

These results suggest that persuasive technology is well-suited to addressing the complex needs of hypertensive patients by enhancing motivation, improving adherence, delivering tailored education, personalizing advice, and providing timely alerts in emergencies. The findings are consistent with existing literature, which underscores the effectiveness of persuasive and mobile health technologies in facilitating behavioral change and improving health outcomes among patients with chronic conditions.

Testing of the hypothesis 2

For H2 One-Sample T-Test was use for the analysis and the result is presented as follow:

			One-Sample Test					
			Test Value = 0					
Persuasive technology is very effective in motivating users to take good care of themselves	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
							Lower	Upper
	.698	.046	97.952	228	.000	4.520	4.43	4.61

Table 6: One-Sample T-Test results

The one-sample t-test shows that the average response (M = 4.52) is very significantly greater than 0**,** with a very high level of confidence. This provides strong evidence that the persuasive technology is perceived as highly effective for changing users' behavior positively. Since the confidence interval (4.43 - 4.61) does not include 0, the difference is not only significant but also meaningful. Practically, this means respondents overwhelmingly agreed that the system is highly effective in motivating users to take good care of themselves**.** Since $P < .001$ $H2_0$ is rejected and $H2_1$ is accepted.

VI. Recommendation

Based on the findings of this study, the following recommendations are proposed to improve hypertension prevention and management among young adults:

1. Health practitioners and policymakers should emphasize the importance of routine blood pressure checks, especially for adults above 60 years, by integrating community-based screening programs and encouraging home-based monitoring.
2. Mobile applications and other digital persuasive technologies should be designed and deployed to motivate users, provide reminders, offer health tips, and track compliance with medical advice. These tools should be culturally relevant, easy to use, and tailored to young adults.
3. AI-powered health applications and wearable devices should be encouraged to personalize hypertension management by analyzing individual health records, providing real-time feedback, and alerting medical personnel or relatives in emergencies.
4. Healthcare providers should establish structured follow-up systems, possibly through SMS reminders, mobile apps, or periodic community outreach, to ensure patients remain consistent with treatment and lifestyle recommendations.

VII. Conclusion

This study investigated the role of persuasive technology in promoting behavioral change among adults toward the prevention and management of hypertension. Findings revealed that while many individuals are aware of the importance of blood pressure monitoring, a large number still adopt reactive rather than preventive approaches, such as checking their blood pressure only when sick or during hospital visits. The results further established that persuasive technology is perceived as highly effective in motivating individuals, ensuring compliance with medical advice, providing tailored education, and offering timely alerts in emergencies.

The study concludes that regular blood pressure monitoring and consistent adherence to medical prescriptions are crucial for reducing hypertension related complications. Persuasive technologies, particularly mobile applications and AI-driven tools, offer a promising solution to bridge the gap between awareness and practice by influencing positive health behaviors. Integrating these digital solutions into healthcare systems can significantly improve health outcomes, reduce undiagnosed cases, and ease the growing burden of hypertension among young adults. Ultimately, controlling hypertension requires a proactive approach that combines routine medical checks, lifestyle modification, and innovative use of technology. With effective awareness and adoption of persuasive health tools, young adults can live healthier lives and avoid preventable hypertension-related crises.

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