

## **Evaluation of the Effectiveness of Mobile Health Technology in Promoting Positive Behavioral Change Among School of Education Students at Kenya Methodist University**

***Harshika N. Patel<sup>1\*</sup>, Njoki Vanessa<sup>1</sup>, Majuma Magdaline<sup>1</sup>, Cherono Sheilla<sup>1</sup>, Andanje Marion<sup>1</sup>, Shonko Martin<sup>1</sup>***

<sup>1</sup> Kenya Methodist University, P.O.Box 267-60200, Meru, Kenya.

\*Correspondence email: [harshika.patel87@gmail.com](mailto:harshika.patel87@gmail.com)

### **Abstract**

The growing popularity of mobile phones has led to the development of an interdisciplinary branch of the healthcare profession known as mobile health (mHealth). As convenient devices with internet access become more widely available, mHealth technology has sparked interest among health professionals in delivering quality care. This study evaluates the effectiveness of mHealth technology in promoting positive behavioral change among students in the School of Education at Kenya Methodist University. It sheds light on mHealth, assesses its effectiveness, and establishes its usefulness in medical practice. The research adopted a cross-sectional survey; a sample size of 384 participants was derived using Fisher's formula from a population of 2,489. A simple random sampling technique was employed to collect data using a structured, pre-tested questionnaire. Ethical clearance was obtained from the Kenya Methodist University Ethical Committee Review Secretariat. Collected data were analyzed using descriptive statistics and represented graphically. The study consisted of more male (58.07%) than female (41.93%) participants, with the majority in their fourth year (n = 132). While 25% of the population were connected to health systems, 75% were not. 93.2% of respondents used internet sites, such as PubMed, or mobile apps, such as the Flow app, as their preferred intervention. More than 50% of students reported that these interventions efficiently promote and sustain positive health behaviors. Lack of engagement and internet access were the significant challenges identified. In conclusion, this research found strong evidence supporting the effectiveness, acceptability, and dependability of mHealth interventions in promoting behavioral change. This study recommends that increasing awareness, particularly in evaluating mHealth for chronic illnesses like diabetes, will eventually decrease mortality and morbidity. This will help policy-makers create better medical interventions.

**Keywords:** *eHealth, Global Observatory for eHealth, mHealth, Technology-Assisted Care*

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## 1.0 Introduction

Behavioral health refers to the state of mental and emotional well-being and/or the choices and actions that affect it. Behavioral health problems include substance use disorders, serious psychological distress, suicidality, mental illness, obesity, and even some diseases, such as sexually transmitted diseases (Murphy et al., 2018). Digital media and resources, such as email, smartphone/tablet applications (apps), online forums, websites, DVDs, CD-ROMs, blogs, computer software, online social networks, telephone and tele-video communication, and mobile devices, are becoming ubiquitous in our culture. The use of electronic media and information technologies in behavioral health treatment, recovery support, and prevention programs is rapidly gaining acceptance. Technology-based assessments and interventions are important therapeutic tools that clinicians can integrate into their work with clients. Additionally, technology allows alternative models of care to be offered to clients with specific needs that limit their ability to participate in, or interest in participating in, more conventional behavioral health interventions. Technology-assisted care (TAC) can transcend geographic boundaries to reach many people who otherwise cannot access services and is useful in a wide variety of settings, including Web-based interventions offered in the home, community organizations, schools, emergency rooms, and healthcare providers' offices, as well as via mobile devices and online social networks (Stone, 2019).

Since the advent of the 21st century, the expansion of telecommunications and mobile phones has been a global phenomenon. Smart communication offers major advantages in mobile health. A meta-study of worldwide mHealth-related research publications found that the United States ranked first in publication volume, indicating the popularity of mHealth

and disease management, which help prevent unnecessary, life-threatening circumstances (Cao et al., 2021). The cellular network of mobile phones currently covers approximately ninety percent of the world, including a significant portion of low- and middle-income countries. Recently, the number of mobile users in Sub-Saharan Africa exceeded 477 million, and in Kenya, demand and interest are also growing. A study in Kenya indicated that 86% of households owned a mobile phone and >80% of internet users (Mayo-Wilson et al., 2022). While healthcare facilities have traditionally provided information, encouragement, and support to patients or healthcare seekers on a consultation basis or through materials such as leaflets, the emergence of mHealth technology presents a promising opportunity to transform the delivery of health messages.

*mHealth* technology, with its comprehensive interventions ranging from monitoring physical activity, blood sugar, and blood pressure to promoting healthy eating habits and routine exercise, addressing smoking and drinking habits, and supporting menstrual cycle and pregnancy trimester tracking, has the potential to improve both physical and mental well-being significantly (Abaza & Marschollek, 2017).

According to the Global Observatory for *eHealth* (GOe), mHealth is supported by many wireless devices, such as smartphones, point-of-care testing devices, and Personal Digital Assistants, to control or manage chronic disorders (Organization, 2011). The main purpose of mHealth is to provide pervasive, patient-centered care, and these devices have improved versions, making access commendable in clinical settings. This technology leverages the mobile phone's primary functions, such as voice and short text messages (Abaza & Marschollek, 2017). It incorporates more advanced applications, including general packet radio service (GPRS),

third-, fourth-and fifth-generation mobile communication platforms (3G, 4G, and 5G systems), global positioning system (GPS), and Bluetooth connectivity. In addition, it is a practical way to encourage healthcare consumers, i.e., patients and the public, to maintain quality of life and prevent chronic illnesses (Abaza & Marschollek, 2017). This modality might improve people's decision-making ability, affecting their health and lifestyle. This study aimed to shed more light on the novel field of mHealth, assess its effectiveness, and establish its usefulness in the future of medical practice.

*“The results show that mHealth technology positively influence behavioral change such as smoking cessation, physical activity, medication adherence, and dietary habits”*

## 2.0 Materials And Methods

A cross-sectional, quantitative survey was conducted at the School of Education, Kenya Methodist University (KeMU), main campus, Meru. The study targeted 2489 full-time university students enrolled in a Bachelor of Education program to obtain a non-biased opinion on the effectiveness of mHealth technology among the general population. Fisher’s formula was used to calculate the sample size.

**Table 1**

*Response Rate of Participants*

<b>Year of Study</b>	<b>Female</b>	<b>Male</b>	<b>Total</b>
Year 1	7.29%	6.77%	14.06%
Year 2	6.51%	4.17%	10.68%
Year 3	22.66%	18.23%	40.89%
Year 4	5.47%	28.91%	34.38%
<b>Total</b>	<b>41.93%</b>	<b>58.07%</b>	<b>100.00%</b>

$$\text{Sample size } (n) = z^2 pq/D^2$$

For the 95% confidence interval, the Z value (standard normal) is set to 1.96, corresponding to a 5% Type I error ( $p > 0.05$ ). p is the prevalence in the study, and the expected population proportion is assumed to be 50%. q is equal to 1-p. The margin of error ( $D^2$ ) was set to 0.05 to ensure precise estimation. The calculated sample size was 384, representing 15.5% of the total face-to-face students in the School of Education ( $n = 2489$ ). Simple random sampling was used to collect the data. The study variables were identified, including types of mobile phones, various uses of mobile health services, and behaviors related to positive mHealth use. A structured questionnaire was developed and pretested for reliability and validity. Each participant was given the informed consent form before data collection began. The Kenya Methodist University Ethical Committee Review Secretariat granted ethical approval for the study. The collected data were organized, encoded, and stored in a Google spreadsheet. The study utilized IBM SPSS Modeler Subscription™ version 1.0 to analyze the data using descriptive statistics (frequency distribution). The results were presented in a frequency table, a pie chart, and a bar graph.

## 3.0 Results And Discussion

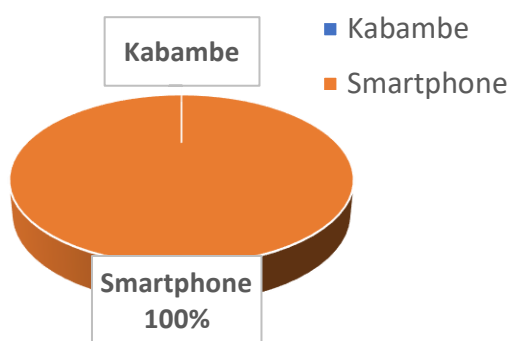
384 participants responded, including 223 males (58.07%) and 161 females (41.93%), as shown in Table 1. The response rate is 100%.

**Type of phone**

According to the data gathered and presented in Figure 1, all respondents used a smartphone, as owning one is considered both academically and socially necessary at the university. Smartphone use indicates that students are connected to the internet, and with guidance and education, they may be motivated to use mHealth applications to support their healthy lifestyle.

**Figure 1**

*Type of Phone used by the Participants*



**Connection with Different Health Systems**

Table 2 below shows the number of students connected to health systems, including the Ministry of Health and hospital systems.

**Table 2**

*Connection of the respondent to any health systems*

Response	Are you connected to any health system? (e.g., Ministry of Health, Hospital)
No	75.00%
Yes	25.00%
<b>Grand Total</b>	<b>100.00%</b>

25% (n=96) of respondents connected to the health system via mobile devices. The rest, 75% (n=288), were not linked to any health system. This was attributable to the fact that most were not on follow-up for any chronic medical conditions. Limited insurance coverage was also a factor, as many students were no longer covered by their parents' insurance or had been exempt from it.

**Effectiveness of mHealth in Causing Positive Behavior Change**

Table 3 shows that internet resources (93.2%, n=357) influenced positive behavior and some awareness of self-care, including knowledge of chronic conditions, their symptoms, precautions, and treatment.

**Table 3**

*Positive Behavior Towards the Usage of mHealth Tools*

Mobile health (mHealth) Technology	Response	
	No	Yes
Internet, e.g., PubMed	6.9%	93.2%
Mobile health application	2.8%	97.2%
Mobile health devices	0.00%	100.0%
SMS	48.3%	51.7%

The individual influence of the various mobile health technologies on positive behavior varied across technologies. Overall, mobile health technologies had a positive impact on most respondents using mobile devices, such as smartwatches, with a 100% positive influence (n=384). A similar study by Alshagrawi & Abidi (2023) found that mHealth significantly

improved positive behavior by increasing physical activity at the workplace. A substantial reduction in body mass index (BMI) was observed, with consistent indications from the mobile health device.

Among those who used mobile applications, such as menstrual and workout plans, 97.2% (n=373) reported a positive influence. A study

by Kim et al. (2021) found a similar correlation: 80% (n=307) of study participants reported that the app helped them become aware of the importance of addressing health behaviors, and 65% (34/52) said that the app motivated them to change their lifestyle habits. This attitude helps prevent future chronic disorders and improves quality of life.

Among respondents who used short messaging services (SMS), 51.7% (n=199) reported that SMS was compelling in influencing positive behavioral change. The study indicates that short messaging services increase the effectiveness of antiretroviral therapy, significantly assisting adherence (Patel et al., 2017) and smoking cessation (Guerriero et al., 2013). That study was conducted in a hospital, but in this study, a large number of participants found SMS ineffective, as other mobile health

technologies developed recently are overtaking SMS among younger people. It may still be effective in healthcare centers to provide efficient patient treatment, thereby improving patient compliance and the effectiveness of long-term therapies. SMS services are certainly convenient for remote areas where internet availability is limited. The positive influence of SMS highlights that active, interactive SMS interventions would improve patients' health outcomes more effectively than passive, one-way SMS interventions (Yasmin et al., 2016). Thus, SMS and its monitoring improve and strengthen the relationship between patients and healthcare providers, from providing shallow information to offering their most suitable, evidence-based treatment.

Table 4 below outlines the various purposes of using mobile health technologies.

**Table 4**  
*Reasons for Using Mobile Health Technology*

<b>Reason for Using Mobile Health Technology</b>	<b>Female</b>	<b>Male</b>	<b>Total</b>
For knowledge/more information	29.17%	36.7%	65.9%
Promoting healthy behavior, e.g., exercise apps	9.11%	17.7%	26.8%
Self-management of chronic conditions	3.65%	3.65%	7.3%

A majority of students (65.9%, n=253) reported using mobile health primarily as a source of knowledge and information. Meanwhile, 26.8% (n=104) used mobile health technology for behavior-change interventions, including exercise apps, nutritional guidance, and smoking-cessation support. Self-management of chronic conditions was the least popular reason, with 7.29% (n=26). This was because the study population was younger, which is less likely to have comorbidities. In comparison to a study of older adults with chronic diseases, where those with mHealth apps reported reasons

such as support in making treatment decisions (53.9%, n=207), discussions with their healthcare providers (53.6%, n=207), and using electronic personal health records (69.4%, n=265) (Wang et al., 2022).

***Challenges Faced While Using Mobile Health Technology***

Challenges encountered while using mobile health technology primarily included a lack of internet access and insufficient engagement or feedback from the mobile health technologies, as shown in Table 5 below.

**Table 5**

*Various Challenges Experienced While Using mHealth Technology*

<b>Challenges faced while using mHealth technology</b>	<b>Female</b>	<b>Male</b>	<b>Total</b>
Cost	1.04%	10.94%	12%
Lack of engagement/feedback	18.49%	16.41%	34.9%
Lack of internet access	13.54%	22.66%	36.2%
Misleading information	8.85%	8.07%	16.9%

Among all participants, 36.2% (n=138) cited a lack of internet access, and 34.9% (n=354) cited a lack of engagement and feedback as the main challenges. The major obstacles to mHealth technology development were security concerns, inadequate knowledge, and a lack of expertise in the technology (Aljedaani & Babar, 2021). The study also noted that stakeholders are less involved and attentive in software development. The main challenges of this study are likely attributed to the fact that the study population consisted of students who depend on guardians for financial support.

***Frequency of Use of Mobile Health Applications***

Table 6 below shows that most respondents (n = 229) used mHealth technology when seeking a medical opinion (59.6%). Mobile health applications can sometimes help with moderate day-to-day activities, manage chronic disorders, and support lifestyle control, such as calorie intake and step counts. According to one study in London, people mostly use innovative technology for social media platforms; very few reported using it for diabetes control, and mHealth applications work well to manage blood sugar (Kayyali et al., 2017).

**Table 6**

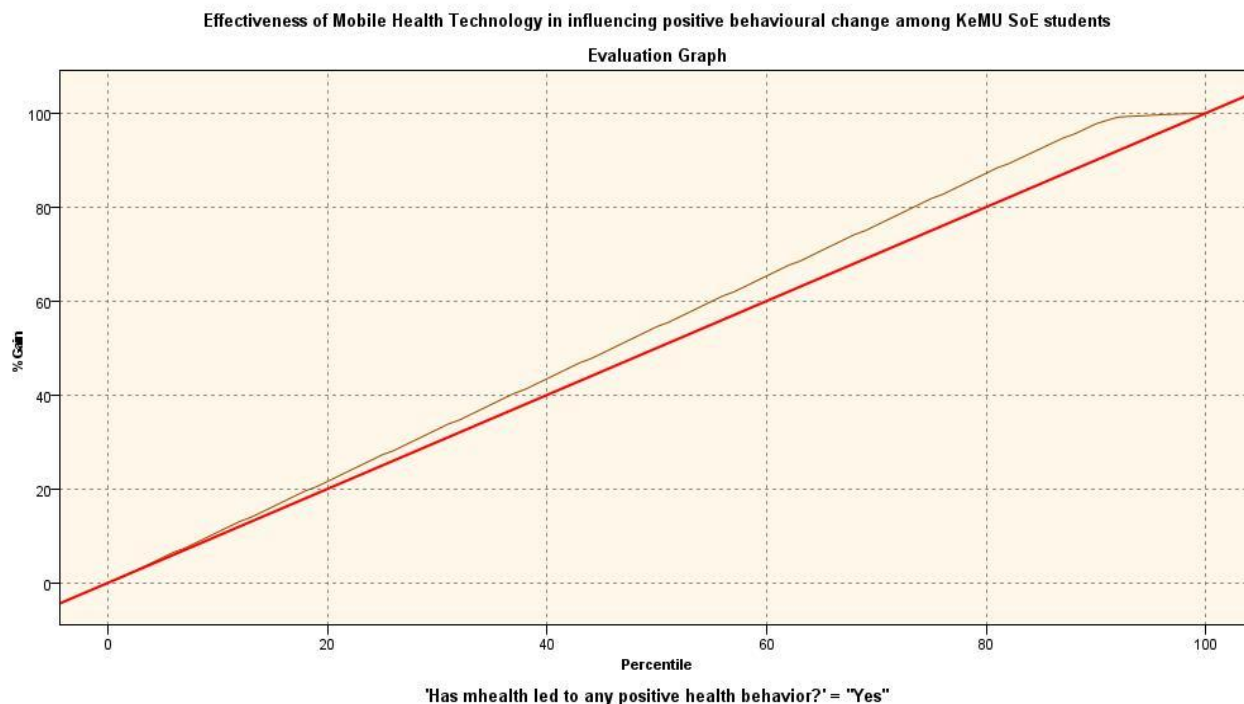
*Frequency of Use of mHealth Technology by Respondents*

<b>How often do you use mHealth technology?</b>	<b>Female</b>	<b>Male</b>	<b>Total</b>
Weakly	8.33%	18.23%	26.6%
A few times a month	1.56%	4.17%	5.7%
Less than twice a month	0.52%	0.26%	0.78%
Weekly	4.17%	3.13%	7.3%
When in need of a medical opinion	27.34%	32.29%	59.6%

Figure 2 illustrates that mHealth has led to positive behavioral changes, with over 90% (n=346) of respondents reporting positive behavioral benefits from using mobile health technology (the red line represents the reference

lines, and the brown line represents the actual observed responses, showing that almost all respondents had positive behavioral outcomes with mHealth technology)

**Figure 2**  
*Evaluation of Expected Results Versus the Obtained Data*



#### 4.0 Conclusion

In conclusion, the results of this study suggest that *mHealth* technology has the potential to positively influence behavioral change in areas such as smoking cessation, physical activity, medication adherence, and dietary habits. Common strategies in these interventions include personalized features, reminders, tracking, and social support. *mHealth* interventions are effective, acceptable, and dependable. While the effectiveness of *mHealth* technology is well-established, further research is needed to understand its long-term impact and to address potential limitations. Nonetheless, *mHealth* technology promises to transform healthcare and improve health outcomes by promoting positive behavioral change. These interventions are integral to primary, secondary, and tertiary disease prevention through positive behavioral change and should be incorporated into healthcare services.

#### 5.0 Recommendations

This study focused on university students in the School of Education, not on any disease-related group. Further studies should select a population with greater representation of individuals with illnesses to more accurately depict the effectiveness of *mHealth* in promoting positive behavioral change. Other constructs, such as health service quality, doctor-patient interaction, and the individualization of *mHealth*, should be studied. Further research is needed to compare preferences for digital therapeutic relationships and face-to-face interventions and to determine how such interactions might affect users' capacity for behavioral change. Regulatory oversight is necessary to address concerns about the credibility, privacy, confidentiality, and security of *mHealth* technology. Doctors and other healthcare professionals should be included in the research and development of *mHealth*

technology to enhance positive behavioral change.

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