From Data to Awareness: Are Smartwatches Driving Awareness and Healthy Lifestyle Changes?

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Abstract. The development of wearable technology allows individuals to monitor their health conditions in real-time. The high rate of technology adoption among adolescents to adults allows smartwatches to potentially become an effective intervention tool in shaping healthy lifestyle behaviors. This study aims to analyze whether smartwatch use can encourage increased health awareness and healthy lifestyle changes in adolescents. A quantitative approach was used in this study with a cross-sectional design involving 121 adolescent respondents aged 17–58 years who had used a smartwatch for at least three months. Data were collected through a Likert-scale-based questionnaire that measured smartwatch use, health awareness, and healthy lifestyle changes. Data analysis was performed using Structural Equation Modeling (SEM). The results showed that smartwatch use had an effect on health awareness of $\beta_xy = 0.684$, with a p-value of 0.000. In addition, health awareness also had an effect on a healthy lifestyle of $\beta_yz = 0.831$, with a p-value of 0.000. The model's goodness-of-fit test used SRMR with a value of 0.086, which is less than 0.1, so the model is considered fit. These findings are expected to contribute to the development of digital technology-based health interventions and serve as a basis for the use of wearable devices in promoting adolescent health in Indonesia.

Keywords: wearable technology, health awareness, healthy life style.

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P. N. G. Akbar and K. A. Safitri (eds.), *Proceedings of the 8th International Conference of Vocational Education, Applied Science and Technology (ICVEAST 2026)*, Advances in Social Science, Education and Humanities Research 1034,
https://doi.org/10.2991/978-2-38476-620-8_5

1 Introduction

The development of digital technology has brought about significant changes in the way individuals monitor and manage their health. One rapidly growing innovation is the use of smartwatches as wearable technology devices capable of monitoring various health indicators such as step count, heart rate, sleep quality, physical activity levels, and even exercise and hydration reminders [1]. Checking the time isn't the only purpose of smartwatches these days. The addition of special features to smartwatches has transformed them into personal assistants for health monitoring[2].

As a generation born into a technologically literate state, the lives of teenagers and adults are inseparable from the dominant use of digital devices [3]. In practice, this tiny device effectively encourages a healthy lifestyle for its users. Its alarm and reminder features, updated with real-time physical data, help users better understand their body and health, motivating them to exercise regularly, improve sleep quality, and monitor their fitness [4].

Previous research has shown that the use of smart wearable devices encourages healthier lifestyle habits because they are able to display the body's health condition in real-time, where the benefits are most felt among teenagers and adults who use smartwatches [5]. Due to the presence of rapid self-monitoring features, other research has revealed that body-worn activity and health status tracking devices have proven successful in motivating individuals to be more active regularly [6]. In addition, recent research shows that the completeness of features for monitoring health status on smartwatches greatly influences user satisfaction, both in terms of improving physical health, social status, and thus improving quality of life [7].

The growing use of smartwatches in Indonesia is a positive trend, especially among teenagers and adults. However, there is still little research to determine whether these devices are effective in transforming health awareness into a better lifestyle. Based on the explanation and findings as background of the problem, this study was designed to explore the relationship between smartwatch use, health awareness, and the realization of healthy lifestyle behaviors. In addition to analyzing the relationship between the three, this research is also expected to contribute to the development of medical device technology that supports individual healthy lifestyles.

2 Literature

2.1 Technology Acceptance Model (TAM)

Fred Davis's model, commonly abbreviated as TAM, remains the primary reference for analyzing a person's level of technology acceptance. Strong intention and motivation underpin a person's adoption of new technology. This is not accidental, but rather a process of rational thought that guides the technology's operation [8].

New technology is used because people believe it can help them be more productive at work. New tools are often used because they save time, reduce errors, and produce better results than other tools [9]. Previous study findings on the use of artificial intelligence show that interest in new technology and people adopting it occurs if they feel the technology really works and is useful for life [2]. Users simply want something simple yet effective to complete their routine tasks. Convenience of using the tool is another important factor to consider. The success or failure of a digital platform is also determined by its user-friendliness, which essentially indicates its ease of use [10].

Trends in modern technology have raised data security issues, paralleling the level of acceptance of innovation. It's no longer just about convenience and usefulness, but also about security systems that safeguard user privacy [11].

2.2 Health Belief Model (HBM)

Although not a new theory, the HBM remains one of the most widely used health behavior theories to explain and predict individual behaviors related to disease prevention, medication adherence, and health technology adoption. Recent publications demonstrate that this model remains highly relevant, especially when combined with other psychosocial factors such as self-efficacy, health literacy, and digital-based interventions [12].

Research trends are now shifting from general health behaviors to applications in digital health, the use of health apps, wearable devices, vaccinations, chronic diseases, and technology-based public health interventions. The flexibility of this theory has widened, from being previously only used in conventional health education, its role is now expanding as a reference in the application of digital interventions to change health behavior [13].

2.3 Self Health Monitoring

Each person's ability to process information to manage healthy lifestyle habits varies greatly. A person becomes more aware of their body's condition if they receive assistance in monitoring their condition to maintain a healthy lifestyle [14].

With the innovation of smartwatch technology, monitoring your body's condition has become much easier and simpler. These smart devices automate the provision of real-time health data. Health targets can be set, allowing you to instantly see whether your daily activities are on track. In practice, this monitoring process will increase health awareness, leading to more informed decisions about changing habits. [15].

Regularly monitoring health data through a smartwatch can help us understand our own habits. People who diligently monitor their physical activity have been shown to exercise more consistently, sleep more regularly, and maintain a healthy weight more easily. The accuracy of this smartwatch eliminates the guesswork of our physical condition. With its self-monitoring features, daily goal setting, progress charts, and alarm and reminder systems, it can motivate these healthy habits over the long term. Therefore, the self-monitoring feature on a smartwatch is a trigger for a healthy lifestyle and helps manage chronic diseases [16].

3 Method

This study employed a quantitative method, aiming to examine how smartwatch use can impact the healthy lifestyles of Indonesia's younger generation, through health awareness as an intermediary variable. An online questionnaire was distributed via Google Forms for two weeks using a Likert scale of 1–5 to 121 respondents who met the criteria: active smartwatch users for at least three months and familiar with its health features. Data were analyzed using SEM-PLS. The results indicate a positive influence of smartwatch use on awareness, which in turn positively impacts a healthy lifestyle. The novelty of this study focuses on exploring smartwatches as a preventive health promotion tool for the younger generation.

4 Results and Discussion

Table 1. Characteristics of Respondents.

Characteristic	Category	n	%
Age group	17 - 25	50	41,3
	26 - 40	19	15,7
	41 - 58	52	43,0
	Age group subtotal	121	100 ,0
Sex	Male	59	48,8
	Female	62	51,2

	Sex subtotal	121	100,0
Education group	High school	13	10,7
	University	108	89,3
	Education group subtotal	121	100,0
Daily routine as	Students	50	41,3
	Formal workers	48	39,7
	Informal workers	7	5,8
	Housewife	16	13,2
	Daily routine as subtotal	121	100,0

Measurement Model Evaluation

Construct validity and reliability are determined by assessing the measurement approach. This process includes examining indicator reliability, internal consistency, and convergent validity. Outer loading values were used to examine indicator reliability, and Cronbach's alpha and composite reliability were used to evaluate internal consistency. Convergent validity was examined using Average Variance Extracted (AVE).

Table 2. Measurement Model Evaluation

Construct	Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Smartwatches Usage	X3	0.778	0.759	0.861	0.675
	X4	0.825			
	X7	0.860			
Health Awareness	Y1	0.788	0.935	0.948	0.722
	Y2	0.873			
	Y3	0.880			
	Y5	0.888			
	Y6	0.802			
	Y7	0.871			
	Y8	0.840			
Healthy Lifestyle	Z1	0.810	0.929	0.945	0.742
	Z2	0.724			
	Z5	0.903			
	Z6	0.935			

Z7	0.905
Z8	0.873

Table 2 shows the assessment of the measurement model. The outer loading values for all indicators ranged from 0.724 to 0.935. Since 0.70 is the established standard value, each indicator was shown to accurately represent the latent concept.

The constructs used were proven to be reliable and valid. This was demonstrated by high internal consistency reliability (Cronbach's alpha 0.759 - 0.935, composite reliability >0.86), and convergent validity that met the criteria (AVE value >0.50). This means that the measurement model met all the assumptions required to proceed to the structural analysis stage.

After establishing the suitability of the measurement model, the structural model was examined to test the suggested variable relationships. Smartwatch usage was shown to have a substantial positive effect on health awareness ($\beta = 0.684$, $p < 0.000$). This indicates that higher smartwatch usage leads to better health awareness. Meanwhile, health awareness has a positive effect on healthy lifestyle behaviors ($\beta = 0.831$, $p < 0.000$).

According to the coefficient of determination ($R^2 = 0.467$), smartwatch usage explains 46.7% of the variation in health awareness. The coefficient of determination (R2 = 0.690) means that health awareness explains 69.0% of healthy lifestyle behavior. The structural model with path coefficients is presented in Figure 1.

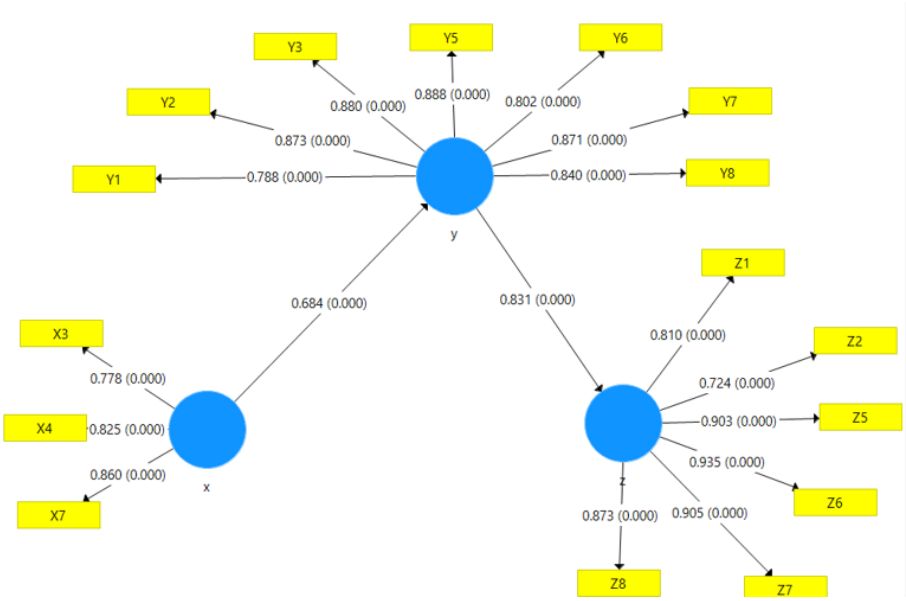


Fig. 1. SEM-PLS Measurement Model.

The results of the study indicate that the measurement model has met the validity and reliability criteria, indicated by the outer loading values of all indicators in the range of 0.724–0.935, Cronbach's Alpha values of 0.759–0.935, Composite Reliability above 0.86, and Average Variance Extracted (AVE) exceeding 0.50. These findings indicate that the instrument used is able to measure the constructs of smartwatch usage, health awareness, and healthy lifestyle behavior consistently and accurately. These results are in line with research in South Korea that used SEM analysis on smartwatch users and obtained good reliability and construct validity to measure smartwatch usage and workout. The study concluded that the instrument based on smartwatch user perception has high measurement stability and is therefore suitable for use in explaining health behavior [17].

The results of the structural model test show that smartwatch use has a positive and significant effect on health awareness ($\beta = 0.684$; $p < 0.001$). Meanwhile, health awareness has a positive and significant effect on lifestyle behavior ($\beta = 0.831$, $p < 0.000$). These findings indicate that the more frequently individuals use the health monitoring feature on a smartwatch, the higher their awareness of their health condition. The more aware a person is about their health, the higher the likelihood of changing healthy lifestyle behaviors. These results are consistent with previous research that found that the self-monitoring feature on a smartwatch increases user engagement in monitoring their body condition and builds awareness of daily health behaviors. The study explained that received real-time health feedback, such as physical activity, heart rate, and sleep patterns, encourages users to reflect on their behavior, thereby increasing awareness of maintaining health [18].

The findings of this study are also supported by a systematic review which concluded that smartwatches have evolved from mere fitness devices into health monitoring media that are able to increase individual involvement in self-managing their health [19]. The continuous monitoring feature allows users to obtain health information quickly, thus encouraging early detection of changes in body condition and increasing awareness to implement preventive behavior [20].

Furthermore, the results of this study indicate that smartwatch use and health awareness can explain 46.7% of the variation in healthy lifestyle behavior ($R^2 = 0.467$). Meanwhile, health awareness can explain 69.0% of the variation in healthy lifestyle behavior ($R^2 = 0.690$). These results indicate that changes in healthy lifestyle behavior are not only influenced by technology use, but also by other factors outside the research model. The R^2 value in the moderate category is a common finding in health behavior research because human behavior is multidimensional and influenced by various psychological and social determinants [21].

These findings align with previous research showing that health interest is positively associated with a health-promoting lifestyle, and this relationship is stronger among smartwatch users than among non-smartwatch users. This suggests that the presence of wearable devices can strengthen the influence of health awareness or interest in actual health behaviors [22].

Smartwatches provide a self-monitoring mechanism through monitoring steps, heart rate, sleep quality, energy expenditure, and activity notifications, thereby increasing health awareness which ultimately encourages the formation of healthy living behavior [23]. Thus, health awareness is a psychological mechanism that bridges the influence of smartwatch use on changes in healthy lifestyles [24]. This finding also extends previous research because it not only discusses the intention to use a smartwatch or the benefits of its health features, but provides empirical evidence that increasing health awareness is an important pathway that explains how smartwatch use can support preventive health promotion among the younger generation in Indonesia.

5 Conclusion

Smartwatches, used routinely to monitor health, have proven effective in promoting healthy lifestyles due to the rise in health awareness. Additional features on these smartwatches have transformed them into personal assistants for monitoring body condition. This study provides insight into how advanced technology can be practically utilized as an educational and preventative tool for users.

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