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Research Article

Impact Of Smart Health Wearables On Lifestyle

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ABSTRACT

Background: Smart health monitoring wearables, including fitness trackers and smartwatches, are increasingly used to monitor physical activity, sleep, heart rate, stress, and health metrics. These devices provide continuous feedback that may influence users' lifestyle choices. **Objective:** This study aimed to analyze the impact of smart health monitoring wearables on lifestyle choices and behaviors and assess users' satisfaction with these devices. **Methods:** A survey-based study was conducted among a diverse group of individuals who use smart health monitoring wearables. Data were collected through a structured questionnaire assessing users' experiences, lifestyle changes, perceived benefits, satisfaction, and limitations of wearable device use. **Results:** The findings showed that smart health monitoring wearables positively influenced users' lifestyle choices. Participants reported greater motivation to exercise and maintain healthy sleep patterns. Real-time feedback encouraged healthier daily decisions, including choosing stairs instead of elevators and maintaining healthier eating habits. However, participants also identified limitations, including inaccurate measurements, limited medical relevance, data security concerns, over-reliance on devices, and limited battery life. Most users considered the benefits to outweigh the potential drawbacks. **Conclusion:** Smart health monitoring wearables can support healthier lifestyle choices through continuous monitoring and real-time feedback. Nevertheless, users should recognize their limitations and avoid relying on these devices as substitutes for medical assessment.

Keywords: health monitoring, lifestyle, physical activity, sleep quality, smart wearables, survey analysis

1. Introduction

Smart health monitoring wearables, are becoming more popular today. These devices allow people to monitor various aspects of their health and wellness, such as physical activity, sleep patterns, heart rate, and more. As wearables gain popularity, there is an increasing interest in understanding how they affect users' lifestyles and behaviors. Smart health monitoring wearables encourage outdoor activity, one of their main benefits. These devices monitor steps, calories burned, and active minutes, giving users real-time feedback on their activity levels. The goal of this research is to investigate the impact of smart health monitoring wearables on lifestyle choices and behaviors using a detailed analysis of survey questionnaire results. Another significant advantage of smart health monitoring wearables is their effect on sleep quality. Many wearables now have sleep-tracking features that measure the duration and quality of sleep. These devices can analyze sleep patterns and provide users with insights into their sleep habits and suggestions for improving sleep quality.

In addition to encouraging physical activity and improving sleep quality, smart health monitoring wearables can assist users in tracking their overall health and well-being. These devices can monitor heart rate, stress

levels, and other health metrics, giving users a complete picture of their health status. Smart health monitoring wearables can promote proactive health management and early intervention by allowing users to monitor their health in real-time. As a result, smart health monitoring wearables have the potential to significantly alter lifestyles by encouraging healthier habits and behaviors [1].

Wearable IoT devices improve lifestyle by enhancing smartwatches and other wearable technologies that track daily activities and provide health insights. These devices help to create a more connected world by allowing users to stay connected while on the go and positively changing the way people live, communicate, and interact with technology. IoT Health Tech is transforming healthcare monitoring and management by providing real-time tracking and data analysis. Wearable IoT health devices, allow for continuous remote monitoring, which improves efficiency and treatment outcomes. These devices provide real-time feedback, allowing users to take control of their health and make better decisions [1]. Integrating wearable health tech and IoT devices presents challenges such as privacy and data security concerns, data collection accuracy, regulatory compliance, and integration with existing healthcare systems [1,2,3]. Navigating these challenges is crucial for the responsible and effective use of wearable health technology and IoT devices in healthcare.

1.1. Literature Review

The literature on wearable technology is rapidly expanding, with studies focusing on a variety of topics including health monitoring, education, and empowerment. Wearables are quite accurate in detecting, predicting, and even treating cardiovascular diseases conducted a systematic literature review on smart wearables for cardiovascular disease detection, highlighting their potential for prediction and prevention.

1.2. Smart Wearables Acceptance Model for Older Adults

Wearable technologies are increasingly being used in education to help students learn. Wearable devices have been studied for their use in a variety of applications, including medicine, and well-being, as well as business and military applications, where their sensor capabilities enable useful tracking features. However, conducted a systematic review and discovered that the use of wearables in education remains relatively low compared to their use in health-related fields [4,5]. The review identified specific uses for wearables to support learning, such as guiding the structure of student learning with smart glasses or headsets and using smartwatches for a variety of purposes across different learning settings. Custom wearable devices and smart clothing have also been used for learning purposes, especially in the form of e-textiles for programming education. Smart wearables have emerged as a promising technology for healthcare and wellness monitoring, gaining traction in recent years. Niknejad et al. conducted a systematic review of the smart wearables literature from 2010 to 2019, revealing a significant increase in research focused on user behavior, technological advancements, security, design improvements, and social acceptance. This review, which includes 244 papers, highlights the growing interest and potential of smart wearables across multiple domains, contributed to this field by creating the Smart Wearables Acceptance Model (SWAM), which is tailored for older adults. Their model identifies key factors influencing older adults' intentions to use smart wearables, such as perceived usefulness, compatibility with their needs, ease of use, and self-reported health status.

1.3. Innovations in Sleep Quality Prediction and Monitoring

In the field of sleep quality prediction and monitoring, developed Wearables-assisted Smart Health Monitoring for Sleep Quality Prediction Using Optimal Deep Learning (WSHMSQP-ODL) [6]. This novel approach entails collecting and preprocessing sleep-activity data before applying a Deep Belief Network (DBN) model to predict sleep quality. They also used the Enhanced Salp Swarm Algorithm (ESSA) for hyperparameter tuning, resulting in improved sleep quality prediction. Such advancements in wearable technology and machine learning algorithms have the potential to improve sleep monitoring quality and promote healthier outcomes. This model entails a systematic process of gathering and preprocessing sleep-activity data to ensure it is ready for analysis. Using a Deep Belief Network (DBN) model, the researchers were able to accurately predict sleep quality, providing valuable insights into an individual's sleep patterns and potential issues.

The researchers used the Enhanced Salp Swarm Algorithm (ESSA) to optimize the DBN model's performance by tuning its hyperparameters. These advances in wearable technology and machine learning algorithms have huge potential for improving sleep monitoring quality and promoting healthier outcomes. Using these technologies allows researchers and healthcare professionals to better understand sleep patterns, identify potential issues, and provide personalized interventions to improve sleep quality and overall well-being.

1.4. Diagnostic Applications of Smart Consumer Wearables

Furthermore, investigate the diagnostic applications of wrist-worn wearables for detecting a variety of health conditions, including cardiovascular diseases, neurological disorders, and metabolic disorders [7]. They emphasize the importance of machine learning models and algorithms in analyzing wearable data, which allows for earlier disease detection and faster treatment response. This highlights the potential of smart wearables not only for health monitoring but also for early detection and intervention, resulting in improved health literacy and patient outcomes.

Wearables can empower people through diagnosis, behavior modification, and self-monitoring. The difficulty in this is to publish research that keeps pace with the rapid advancements of health technology. The adoption of wearables r may be slow and difficult, but strategic change is possible, with each party benefiting greatly in the end. The literature on wearable technology emphasizes its applications in a variety of fields, most notably healthcare and education. Wearables have shown promising results in detecting and preventing cardiovascular diseases, but their application in education remains limited [8].

One of the difficulties in researching wearables and empowerment is keeping up with the rapid advancements in wearable health technology. As new devices and technologies emerge, researchers must adapt their methodologies and approaches to keep their research relevant and informative. Furthermore, while the adaptation of wearables in the health sector is difficult, strategic changes can be made to speed up the process. Researchers, healthcare providers, and policymakers can collaborate to foster widespread adoption of wearables in healthcare [9,10].

The literature on wearable technology emphasizes its applications in a variety of fields, including healthcare and education. Wearables have shown promising results in the detection and prevention of cardiovascular diseases, demonstrating their potential to improve health outcomes [11,12].

1.5. Objectives of the Study

The objective of the research is to look into the association between demographic variables such (age, gender, employment status, and duration) and satisfaction, recommendation. The study's goal is to determine whether these demographic factors have a significant impact on satisfaction levels and recommendations in a sample population.

2. Methods

The methodology for this study included creating and administering a survey questionnaire to investigate the impact of smart health monitoring wearables on lifestyle. the survey questionnaire was designed to be comprehensive and easy to understand. It asked participants about the smart health monitoring wearable devices they used, for how long they used them, and which health metrics they monitored with these devices. The survey included around 80+ participants aged 18-55 or older. Participants from different demographics, including different ages, genders, and ethnicities, were carefully selected to ensure a diverse sample [13]. This diversity was necessary to capture a broad range of experiences and perspectives on the utilisation of smart health monitoring wearables. After the collection of survey responses, the data was analyzed to identify patterns and trends regarding the impact of smart health monitoring wearables on lifestyle [14,15]. Statistical analysis techniques were used to quantify the responses and identify any significant correlations between wearable usage and lifestyle changes [16].

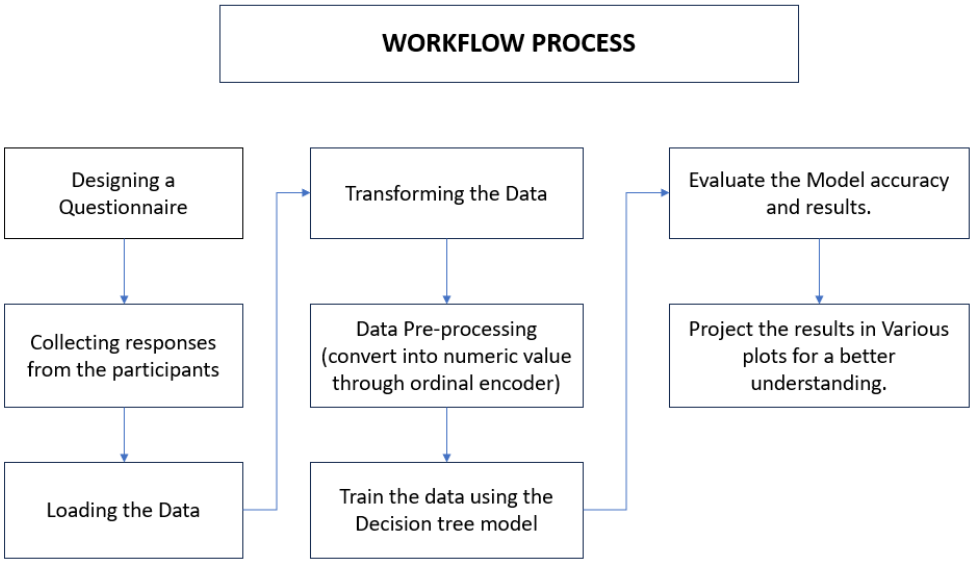

Figure 1. Workflow Process

The data was tested using both Chi-Square and Machine Learning Algorithm for accurate analysis. The data was trained using a machine learning (ML) algorithm, decision tree, to examine the effect of smart health monitoring wearables on lifestyle satisfaction and recommendation. the dependent variables in the analysis were participants' levels of satisfaction and likelihood to recommend these wearables. Age, employment status, and self-reported smartwatch usage for tracking sleep, food intake, and exercise habits were all independent variables.

The decision tree model achieved an accuracy score of 0.7308 and 0.7692, indicating its ability to predict satisfaction and recommendation based on the independent variables. The analysis found significant correlations between age, employment status, smartwatch use for sleep monitoring, food intake monitoring, exercise tracking, and lifestyle satisfaction and recommendation.

3. Results

Table 1 demonstrates descriptive statistics, where the majority of respondents (72.6%) would recommend the product or service, while only 27.4% answered "No" to the recommendation question. the majority of respondents identify as "satisfied" or "neutral". the largest age group represented is 18-24 years. the gender distribution is almost equal and a slightly higher proportion of respondents are employed than unemployed.

The smart health wearables appear to have a positive impact, as the majority of respondents would recommend it. satisfaction levels are generally positive, with a sizable proportion being satisfied or neutral. the most engaged age group is 18 to 24. Employment status has no significant effect on recommendation or satisfaction. The duration of use varies, but many people have used the product/service for 1-2 years. Overall, smart healthcare wearables appear to be well-received, particularly by younger users.

Table 1. Descriptive Statistics of the Respondents' Characteristics

Variable		Frequency	Percent
Recommend	No	23	27.4
	Yes	61	72.6
Satisfaction	Dissatisfied	6	7.1
	Neutral	25	29.8
	Satisfied	34	40.5
	Very dissatisfied	6	7.1
	Very satisfied	13	15.5
Age	18-24	31	36.9
	25-34	25	29.8
	35-44	7	8.3
	45-54	13	15.5
	55+	8	9.5
Gender	Female	40	47.6
	Male	44	52.4
Employment Status	Employed	45	53.6
	Unemployed	39	46.4
Duration	1 to 2 years	24	28.6
	6 months to 1 year	22	26.2
	Less than 6 months	21	25.0
	More than 3 years	17	20.2

3.1. Inferential Statistics: Test for Association between Gender, Age, Employment Status, Duration of Usage and Overall Customer Satisfaction of Smart Health Wearables

Table 2 summarizes the results from the Test for Association between Gender, Age, Employment Status, Duration of Usage, and Overall Customer Satisfaction with Smart Health Wearables. Age and satisfaction have a strong association, with a Pearson Chi-Square value of 31.820691 and a p-value of 0.010551 (< 0.05). This suggests that age is strongly associated with satisfaction. Gender and satisfaction do not have a significant association, with a Pearson Chi-Square value of 4.999624 and a p-value of 0.287336 (>0.05). There is no strong evidence that gender influences satisfaction. Employment status and satisfaction have a p-value of 0.103405 (>0.05) hence they do not have any significant association. Duration and satisfaction also have an association, with a Pearson Chi-Square value of 42.416733 and a p-value of 0.000028(< 0.05). Age and duration are important factors associated with satisfaction, while gender and employment status have no statistically significant relationships.

Table 2. Relationships between Gender, Age, Employment Status, Duration of Usage, and Overall Customer Satisfaction with Smart Health Wearables

Demographic Variable	Item	Pearson Chi-Square	p-Value
Age	Satisfaction	31.820691	0.010551
Gender	Satisfaction	4.999624	0.287336
Employment Status	Satisfaction	7.695154	0.103405
Duration	Satisfaction	42.416733	0.000028

3.2. Inferential Statistics: Test for Association between Gender, Age, Employment Status, Duration of Usage, and Recommendation for Smart Health Wearables

Table 3 shows the association between Gender, Age, Employment Status, Duration of Usage, and Recommendation for Smart Health Wearables. The association between age and recommendation is not statistically significant as the p-value is 0.35894 (>0.05). It shows no strong evidence to support an association

between age and recommendation. Gender and recommendation do not have an association as the p-value is 0.135406 (>0.05). Employment status and recommendation also do not have any association as the p-value is 0.410194 (>0.05). Duration appears to be the most influential factor in recommendation and Satisfaction, while age, gender, and employment status do not have significant associations.

Table 3. Relationships between Gender, Age, Employment Status, Duration of Usage, and Recommendation for Smart Health Wearables

Demographic Variable	Item	Pearson Chi-Square	p-Value
Age	Recommend	4.36432	0.35894
Gender	Recommend	2.229405	0.135406
Employment Status	Recommend	0.678239	0.410194
Duration	Recommend	19.052329	0.000267

4. Discussion

4.1. Heat Map

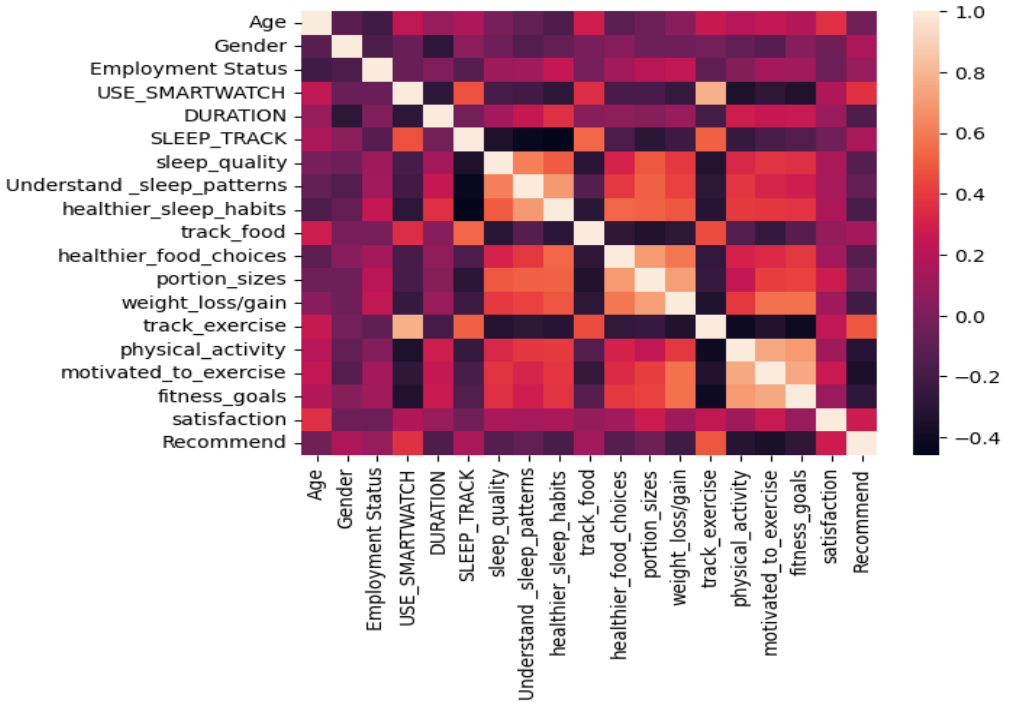

Figure 2. This heat map shows the correlation between variables and Satisfaction analyzed from the data

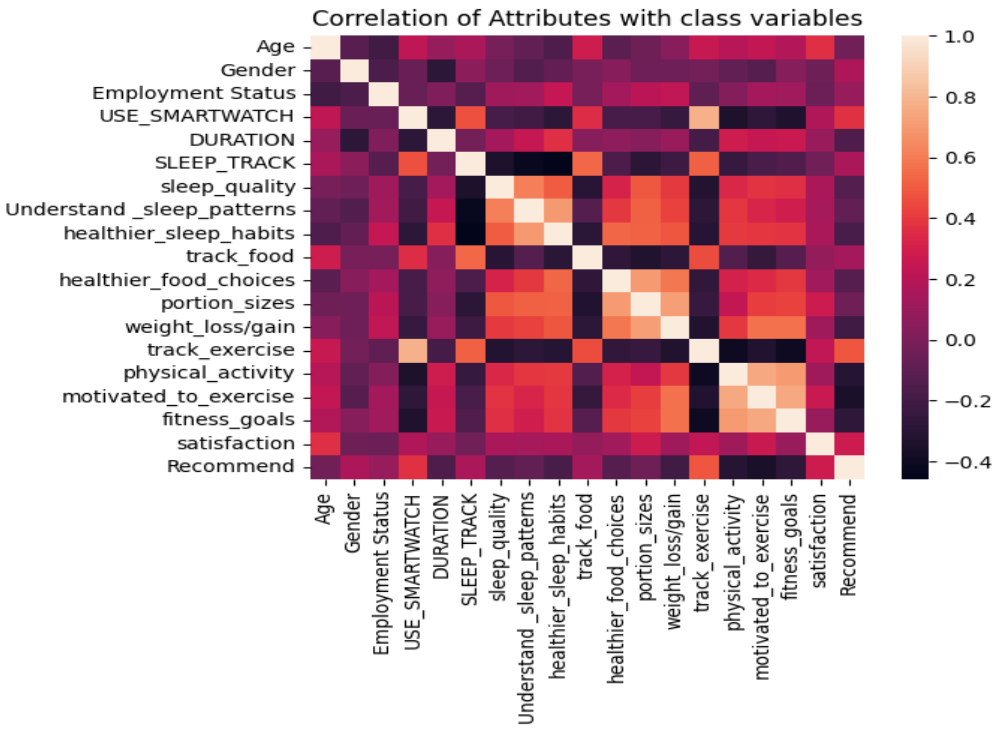

Figure 3. this heat map shows the correlation between variables and Recommendation analyzed from the data

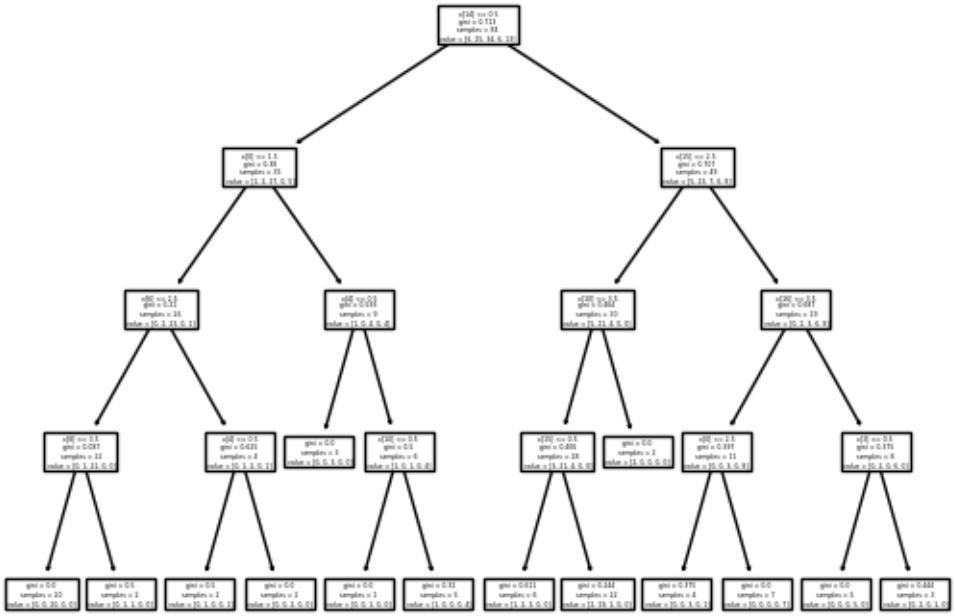

Figure 4. This diagram shows the decision tree model trained from variables and satisfaction

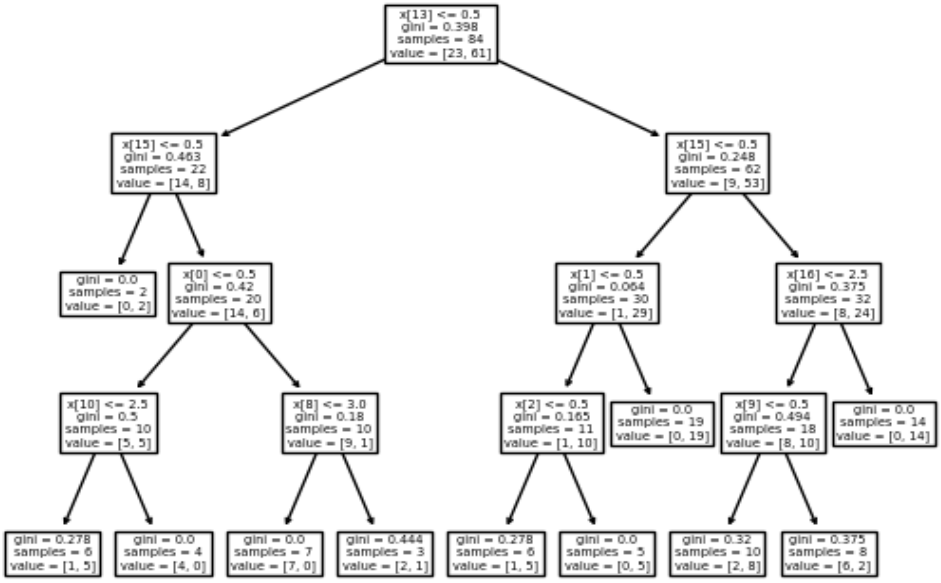

Figure 5. This diagram shows the decision tree model trained from variables and recommendation

The vast majority of participants reported using smart health monitoring wearables, with fitness trackers being the most popular choice. This indicates that these devices are widely accepted and adopted by the general population. It indicates that smart health monitoring wearables have a beneficial effect on lifestyle choices and behaviors. Participants reported increased satisfaction which shows the impact of smart health wearables on their lifestyle. this demonstrates the importance of wearable technology in providing users with actionable data and personalized guidance to improve their health outcomes. The Model accuracy score of 0.7308 and 0.7692 indicates that the decision tree model accurately predicted lifestyle satisfaction and recommendations based on the independent variables (age, employment status, smartwatch usage for sleep, food intake, and exercise) approximately 73.08% and 76.92% of the time.

5. Conclusion

Our findings revealed several significant correlations. When smart health monitoring wearables were used by younger age groups and employed individuals, they reported higher levels of lifestyle satisfaction. Furthermore, participants who used smartwatches to track their sleep, food intake, and exercise habits reported higher levels of satisfaction and were more likely to recommend these wearables to others. One possible explanation for this finding is that younger people and those who are employed may be more willing to adopt and incorporate new technologies into their daily lives. They may also be more proactive about their health and wellness, resulting in a greater appreciation for the advantages of smart health monitoring wearables. Participants who expressed most satisfaction were most likely to recommend the wearables to others. This suggests that satisfaction with smart health monitoring wearables is important not only for individual users but also for their willingness to recommend these devices to peers and colleagues.

The vast majority of participants (47 out of 84) reported being satisfied or very satisfied with their smart health monitoring wearables. This suggests that these devices are generally well-received by users. A significant number of participants (61 out of 84) said they would recommend smart health monitoring wearables to others. This suggests that users are very satisfied and have a high perceived utility. the data also reveals that the majority of participants (65 out of 84) use smartwatches for health monitoring. This demonstrates a strong interest in using technology to track health metrics. Overall, based on the data, it is clear that smart health monitoring wearables are well-received by users and have a significant impact on lifestyle satisfaction. the data strongly suggests that smart health monitoring wearables play an important role in increasing lifestyle satisfaction. Their ability to track health metrics and provide meaningful insights appears to improve user's lives, making them a valuable tool for promoting health and well-being.

5.1. Managerial Implications

This study's findings have significant managerial implications for healthcare providers, technology developers, and policymakers. First, healthcare providers can use smart health monitoring wearables to improve patient

outcomes and satisfaction. By encouraging patients to use wearables to track their health metrics, healthcare providers can gain valuable insights into their patients' health and tailor treatment plans accordingly. This can result in more personalized and effective healthcare delivery.

Second, technology developers can apply the findings of this study to improve the design and functionality of smart health monitoring wearables. Developers can create wearables that better meet user needs and expectations by focusing on features they value the most, such as sleep tracking, food intake monitoring, and exercise tracking. Furthermore, developers can explore integrating AI and ML to provide personalised insights.

Third, policymakers can influence the adoption of smart health monitoring wearables. Policymakers can encourage more people to use wearables and improve population health outcomes by offering insurance discounts or subsidies. Policymakers can also encourage research and development in this field to improve the effectiveness of these devices.

5.2. Future Scope

The findings of this research point to several promising future directions for research and development in the field of smart health monitoring wearables. One important area for future research is improving the functionality and features of these devices. For instance, incorporating more advanced sensors and algorithms may allow wearables to provide more accurate and personalized health insights. Furthermore, combining these wearables with other healthcare technologies, such as telemedicine platforms, may increase their utility and impact on lifestyle satisfaction. Also, experimenting with the integration of artificial intelligence (AI) and machine learning (ML) algorithms in smart health monitoring wearables could significantly improve their performance. AI and machine learning could enable these wearables to provide more personalized recommendations and insights based on individual health data, resulting in more effective health-management strategies.

6. Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to privacy and ethical considerations but are available from the corresponding author upon reasonable request.

7. Ethical Statement

Sumatera Medical Journal (SUMEJ) is a peer-reviewed electronic international journal. This statement below clarifies ethical behavior of all parties involved in the act of publishing an article in Sumatera Medical Journal (SUMEJ), including the authors, the chief editor, the Editorial Board, the peer-reviewer and the publisher (TALENTA Publisher Universitas Sumatera Utara). This statement is based on COPE's Best Practice Guidelines for Journal Editors.

8. Author Contributions

All authors contributed to the design and implementation of the research, data analysis, and finalizing the manuscript.

9. Funding

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10. Acknowledgements

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11. Conflict of Interest

Authors declares no conflict of interest.

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