

PAPER

The Impact of Smartwatches on Health and Lifestyle: A Study on Jordanian Society

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ABSTRACT

The widespread adoption of smartwatches plays a crucial role in promoting healthy behaviors by tracking vital signs, monitoring daily activities, and encouraging more health-conscious living. Smartwatch technology is significant in its ability to raise awareness and motivate users, helping mitigate health risks associated with inactivity and unhealthy habits. This study surveyed 384 smartwatch users to examine their usage patterns and the impact of smartwatches on maintaining a healthy lifestyle. The findings reveal that integrating smartwatches into daily routines enhances health behaviors including improved sleep, physical activity, and cardiovascular health. However, certain challenges, such as discomfort during sleep, sensor inaccuracies, high costs, and privacy concerns, may limit user engagement and device effectiveness. The study underscores the role of smartwatches as effective preventive health tools but also emphasizes the need for improvements in sensor accuracy and privacy policies. Future research should explore the long-term effects of smartwatch usage on physical and neurological health, with a focus on sustained health outcomes and user satisfaction. This study contributes to the growing body of evidence on the potential of wearable to support chronic disease prevention and health promotion.

KEYWORDS

digital health behavior, health monitoring, wearable health technology, vital signs, mobile health

1 INTRODUCTION

Technology has become an integral part of our daily lives. Consequently, the extensive use of technology has made life easier and more diverse than ever before [1]. This progress has led to increased innovation across various domains, including the economy, education, and healthcare. Wearable devices, particularly smartwatches, have emerged as one of the most popular technological trends. These devices are used for multiple applications, including communication (answering calls and receiving notifications) and sports (step counting, sleep monitoring, and calorie tracking).

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They also play a crucial role in health monitoring by tracking blood oxygen levels, stress levels, and heart rate [2].

One of the most important data collected on hospital patients is vital signs [3], [4], defined as respiratory rate, heart rate, body temperature, oxygen saturation, and blood pressure. Vital signs are an active area of research in the past several decades, and findings from the literature suggest that changes in vital signs have been an important determinant of significant risk to the health of the body [5], [6].

Regularly monitoring vital signs is included in a person's health care routine. Smartwatches have enabled individuals to monitor their blood pressure and heart rate in real time, without the need to visit a healthcare facility or invest in costly equipment. In the past, a person had to go to a health center or hospital to have their heart rate measured by having an electrocardiogram (ECG) [7]. One of the most important factors that positively impacts the reduction and control of health risks is the integration of smartwatch vital signs data with electronic health records, which enhances patient health monitoring and personalized care [8], [9]. In Canada and the United States, stakeholders have integrated health, behavioral, and biometric data by developing application programming interfaces in electronic health records to better understand the social determinants of health and identify health interoperability challenges [10].

Smartwatches contain vital sensors. The usefulness of vital sensors has increased dramatically when combined with Internet of Things (IoT) applications [11]. One of the most important features of the IoT is that it facilitates continuous, real-time monitoring of vital signs to ensure accurate health data collection [12]. Smartwatches collect, analyze, and seamlessly transmit physiological information, thus enhancing efficiency and reliability. As developments continue, the scope of healthcare applications expands, as devices that support the Internet of Things can continuously monitor vital signs such as heart rate and use them to identify risk indicators for cardiovascular diseases and can also monitor blood glucose levels for diabetics with high accuracy [13].

Monitoring vital signs continually is essential for preventing possible risks to the body [14]. When data from smartwatch sensors are connected with electronic health records systems, it is easier to identify discrepancies in measurements and data [15], [16]. In this context, this study explores the potential of smartwatches to provide support for individuals to enhance a healthy lifestyle and increase health awareness in the Jordanian community through the tracking of vital signs over time and explores the contribution of monitoring vital signs such as heart rate, quality of sleep, levels of physical activity, and levels of stress to achieve better health outcomes and better health behaviors. In addition, this research aims to demonstrate how, through the examination of health observations in real-time, early detection of possible health risks can be achieved.

This study takes a quantitative research approach by exploring the influence of smartwatches on health behaviors within Jordanian society through surveys. The research examined how continuous monitoring of vital signs and activity tracking through smartwatches will impact a healthy lifestyle.

This paper contributes to the previous literature by examining smartwatch usage patterns and health behaviors in a Jordanian society, where usage of wearable health technology is a less-studied area [17]. This research not only adds to the body of knowledge in wearable technology but also provides an understanding of how real-time health observations can use smartwatches to help identify early health risks, primarily in developing regions such as Jordan.

2 RELATED WORKS

Over the last few decades, research interest in the concept of wearable health has increased significantly, with many health advantages offered by the novel aspect of monitoring health that wearable technology affords, which include convenience and ease of use, medical cost savings, and swift access to patients from home [18]. Wearable health technology assists in the early diagnosis of disease and interventions at any time. As wearables are more widely deployed in this field, a new branch of monitoring personal health has recently been enabled in smartwatches that give the individual the ability to continuously and accurately track their vital signs [19]. Recent studies have explored the ability of wearables to facilitate healthy behaviors and assist users in their health monitoring, but challenges, including privacy, data sharing, and market issues remain [20]. There are numerous barriers to consistent usage of smartwatches, such as a lack of motivation to wear the smartwatch, inability to find the device, privacy issues, technical problems, or having an outdated device. The goals to overcome barriers associated with the environment support the need for a better user-experience design, device robustness, and improved user trust.

The merger of the IoT and wearables is leading to better health management. The IoT and wearable technologies may lead to healthier behaviors and improved wellness. This supports consumers in making healthier lifestyle choices and sustaining behavior changes. The findings thus demonstrate the potential of behavior change techniques (BCTs) in IoT applications. Effective BCTs in wearables can improve health outcomes, enhance resource utilization, and promote behavior change in users [21]. In this regard, wearable technologies present significant potential for personalized health interventions, which are essential to improving health behaviors over the long term.

The researchers analyzed differences in health attitudes and satisfaction with smartwatch use from users in Singapore and Taiwan [22]. Their findings revealed cultural and regional influences on the adoption of technology, with users in Singapore expressing greater health concerns and more involvement with wearable technology. This highlights the importance of region and culture when considering the promotion of health-based technologies. These types of studies contextualize the use of smartwatches and the contributions they play in sustaining healthier lifestyles, especially concerning the regional differences in a person's ability to access health resources.

The ongoing research of IoT-based health monitoring systems highlights the need for more continuous data collection from smart devices. A recent study [23] investigated developing a complete IoT health monitoring system that would provide user data on vital signs in real-time and present the obvious usefulness of wearables by notifying users of potential health risks. This work builds on earlier findings that showed smartwatches as a key platform in health management and continuous monitoring systems.

In another study, [24] highlighted the acceptance of wearable health technologies in Saudi Arabia and provided insights into how users would engage with health-related smart devices in the future. The study emphasized technological trends and health motivation, which are both important for understanding smartwatch adoption in the Middle East. This research is relevant for Jordan because both cultures and societies have similarities that will affect the usage patterns of smartwatches in the region.

Research conducted by [25] examined how smartwatches with indoor localization capabilities and continuous health monitoring have the potential to enhance elderly care. This study represents an aspect of health monitoring for a vulnerable

population and demonstrates a way that wearable technologies support the monitoring of physical health and also monitoring for safety through location. While the primary focus is on elderly care, the implications of the results are important for exploring how wearables can influence health management for age-diverse groups.

Further research on smartwatches' role in behavior change, particularly in developing regions, has been limited. This study aims to fill the gaps in existing research by examining the impact of smartwatch usage on the adoption and maintenance of healthy lifestyles through continuous monitoring of vital signs in Jordan. While previous studies have demonstrated the potential of wearable devices to promote health, there remains a need to explore how personalized interventions, sustained user engagement, and overcoming challenges such as privacy concerns and device abandonment can be achieved. The research will aid in a greater understanding of smartwatches' ability to promote behavior change, improve health outcomes, identify potential health issues, and facilitate early intervention. Therefore, this study aims to improve wearable health technology to make health interventions more impactful and sustainable, particularly regarding Jordanian society.

3 METHODOLOGY

The study uses a quantitative research method to study the influence of using a smartwatch on health behaviors. The research design is focused on collecting descriptive data and a statistical analysis to understand the relationship between the use of a smartwatch and the effects of that use on users' health. The study will use structured surveys and utilize statistical tools to provide a structured analysis of how using a smartwatch continuously and consistently impacts the health outcomes and lifestyle habits of the participants. The methodology is divided into two sections: the quantitative approach and survey methodology.

3.1 Qualitative approach

This study aims to understand how the continuous use of wearable devices affects a healthy lifestyle. For this study, quantitative research methods such as structured surveys and statistical analysis were used to collect users' opinions and views on the impact of their use of smartwatches in following a healthy lifestyle by monitoring vital signs and tracking physical activity. Quantitative research focuses on measuring data numerically and analyzing it using statistical methods to establish patterns and correlations. Researchers typically use structured surveys or questionnaires to collect this data, which is then analyzed using statistical tools such as t-tests or chi-square tests to assess the significance of the findings [26], [27].

3.2 Survey methodology

The survey was designed to gather comprehensive information. It was created using Google Forms to collect primary data from the target audience. The survey consists of four sections. The first section provides an introductory overview of the research goals and objectives. The second section includes socio-demographic questions, such as age, gender, and educational level. The third section focuses on the respondent's behavior, including their preferred brand, smartwatch usage patterns,

and ideal usage behaviors. The fourth section targets previous smartwatch users, aiming to understand why they discontinued use. The survey responses varied and included multiple-choice, rating scale, and checkbox formats. It was distributed through social media platforms such as Facebook, Instagram, and WhatsApp. The survey was available from November 3, 2024, to December 3, 2024. When data collection was complete, the responses were imported into spreadsheets for analysis. In most instances, the data will be summarized using descriptive statistics, and inferential statistics then will be used in exploratory analyses, including t-tests as evidence of any relevant differences and relationships.

4 RESULTS

The purpose of this study is to evaluate smartwatches' use of vital signs monitoring to enhance lifestyle in members of the Jordanian society. According to the Department of Statistics in Jordan, the population of Jordan in July 2024 is estimated at 11 million [28]. To make it easier to identify the target community for the study, the Jordanian society is divided into three regions: the northern region, the central region, and the southern region.

To determine the sample size, the following equation was applied [29]:

$$n = \frac{N \cdot Z^2 \cdot p \cdot (1 - p)}{E^2 \cdot (N - 1) + Z^2 \cdot p \cdot (1 - p)}$$

n : the sample size

N : the size of the target population

Z : the confidence level

P : the estimated proportion of the population with the characteristic of interest

$1-p$: the proportion of the population without the characteristic of interest

E : the margin of error

Using the above equation with a 95% confidence level and a 5% margin of error, the required sample size was calculated to be 384 respondents. This number ensures the required level of accuracy. Table 1 presents the sample overview.

Table 1. Characteristics overview

Socio-Demographic	Categories	Participants #	Percentage %
Age	17–27	174	45.31%
	28–38	112	29.17%
	39–49	67	17.44%
	50–60	22	5.72%
	61 and above	9	2.34%
Gender	Male	174	45.31%
	Female	210	54.68%
Region	Northern	136	35.41%
	Central	159	41.4%
	Southern	89	23.17%

(Continued)

Table 1. Characteristics overview (*Continued*)

Socio-Demographic	Categories	Participants #	Percentage %
Income	Less than 290 JD	95	24.73%
	290–500 JD	121	31.53%
	501–1000 JD	81	21.09%
	1001–1500 JD	48	12.5%
	More than 1500 JD	39	10.15%
Educational level	High School	63	16.40%
	Diploma Degree	47	12.23%
	Bachelor's Degree	189	49.21%
	Master's Degree	53	13.80%
	Ph.D. or higher	32	8.33%

As shown in Table 1, after distributing the questionnaire to the study community, which includes 384 respondents, the largest age group was between 17 and 27 years old, representing 45.31% of the respondents. This suggests that the youth category is the most active group in using technology, likely due to their greater awareness of technological advancements. Smartwatches, which offer multitasking features such as electronic payments and controlling notifications, are attractive to this age group. Moreover, young people are often more influenced by fashion trends and advertisements, prompting them to buy and use smartwatches.

Interestingly, the survey showed that a higher percentage of female respondents (54.68%) participated compared to male respondents (45.31%). This slight difference could be due to females' heightened interest in health functions and aesthetic aspects related to wearable devices.

Regarding education, 45.3% of respondents had a bachelor's degree, which aligns with the fact that education tends to increase health awareness and familiarity with technology. The central region had the highest participation (41.4%), likely due to its economic and commercial prominence, which includes the capital, Amman, and other major cities. The northern region also had a significant proportion of participants (35.41%), attributed to the region's universities and colleges, which play a role in raising health and technology awareness.

Regarding income, the largest group of respondents (31.51%) earned between 290–500 JD, which reflects the economic factors in Jordan, especially in the central region, where smartwatches and other health-promoting technologies are more widely accessible.

Table 2. Paired t-Test results for health metrics before and after using smartwatches

Health Metric	Mean (Before)	Mean (After)	t-Statistic	p-Value
Sleep Duration	5.5 hrs	7 hrs	t = 3.42	p < 0.05
Heart Rate	80 bpm	70 bpm	t = 2.15	p < 0.05
Steps per Day	2,000	5,000	t = 4.67	p < 0.01
Calories Burned	1,500	2300	t = 4.29	p < 0.01

Table 2 presents the paired t-test results for each of the key health metrics measured in the study. The results show that the improvements in sleep duration, heart rate, steps per day, and calories burned were all statistically significant, with p-values indicating strong evidence that the changes observed were unlikely to have occurred by chance. These results confirm the positive impact of smartwatch use on users' health behaviors.

As shown in Table 2, the changes in health behaviors among respondents before and after using the smartwatch. Notably, respondents showed a significant improvement in sleep duration. On average, respondents slept 5.5 hours per day before using the smartwatch, and this increased to 7 hours per day after using the smartwatch. A paired t-test revealed that the difference in sleep duration was statistically significant ($p < 0.05$). This change can be attributed to the smartwatch's reminder feature, which helps users follow personalized sleep schedules.

Heart rate also improved. The average heart rate before the smartwatch was 80 bpm, and the average heart rate after was 70 bpm. The difference was statistically significant based on the results of the paired t-test ($p < 0.05$). The improvements in heart rate are likely a result of aspects of the smartwatch that track stress levels and offer relaxation exercises that help reduce heart rate.

Concerning physical activity, the respondents reported an average of 2,000 steps per day before using the smartwatch. After respondents began using the smartwatch, their average daily step count increased to 5,000 steps, a difference that reached significance as well ($p < 0.01$). Smart watches offer reminders and alerts throughout the day to help users complete their daily step goals and move more regularly. Respondents also appeared to burn, on average, an additional 800 calories after smartwatch use, which also indicated more physical activity than previously ($p < 0.01$).

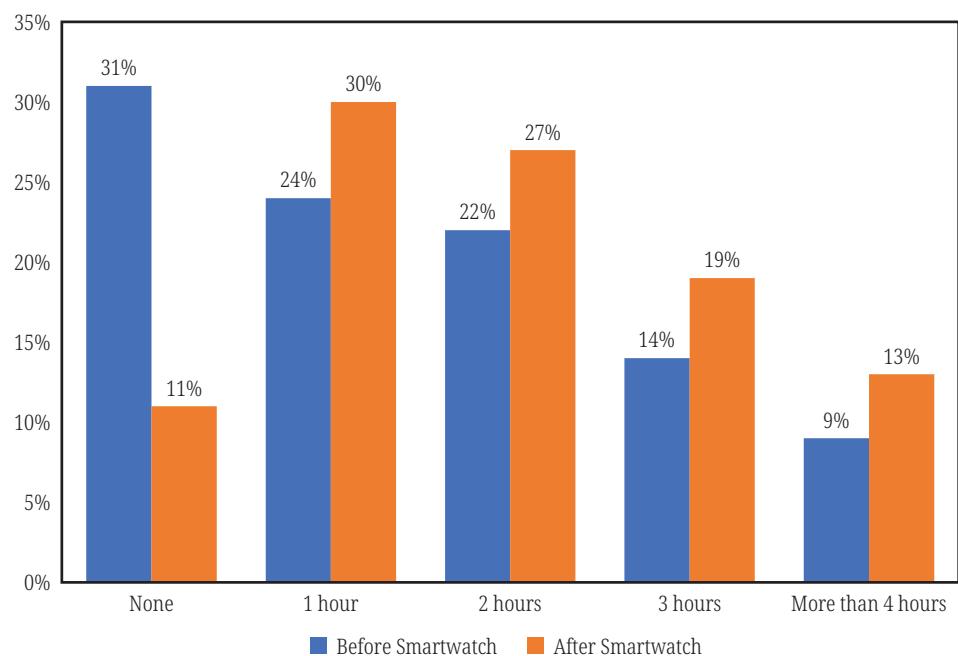


Fig. 1. Respondent's hours of physical activity before and after using smartwatches

Referring to Figure 1, it shows the effect of using smartwatches on improving a healthy lifestyle through exercise. According to the survey results, 31% of respondents were not physically active before using the smartwatch, 24% of respondents exercised for one hour per week, 22% of respondents exercised for two hours per week,

14% of respondents exercised for three hours per week, and 9% of respondents exercised for more than three hours per week. It can be noted from Figure 1 that the percentage of respondents who do not exercise with their acquisition of smartwatches decreased by 20%, which is a significant percentage, and is considered a very good percentage for the effect of the smartwatch on improving healthy behaviors such as motivating the user to exercise. There are also clear differences in the changes in the percentages in the number of hours they exercise. This positive difference can be explained by the fact that the smartwatch contains continuous alarms to remind the user to move when spending long periods of sitting, in addition to a pedometer to reach the goal of achieving the ideal number of steps, which increases the user's sense of accomplishment, thus continuously motivating the completion of exercises. In addition, smartwatches contain many health features such as monitoring sleep patterns, activity levels, and vital signs of the body in a continuous manner, which enhances a healthy daily pattern.

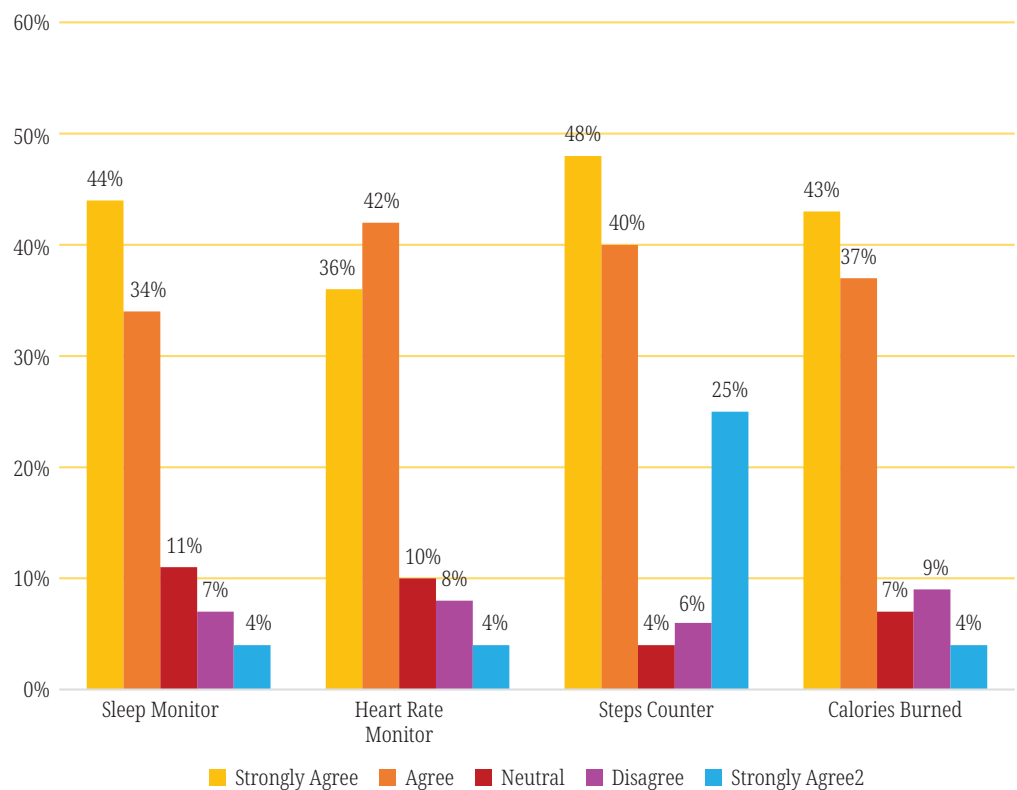


Fig. 2. The impact of smartwatch uses on the vital signs of the respondent

Figure 2 included measuring the percentage of agreement with the change in health behaviors, sleep monitoring, heart rate monitoring, step counting, and calories burned. Figure 2 shows the results of the survey using the Likert scale. Referring to the results, for sleep monitoring, when respondents were asked if there was a positive change in their sleep patterns, the highest percentage of responses was “strongly agree” at 44%, reflecting the respondents’ feeling of improved sleep after using the smartwatch. This is because smartwatches provide a comprehensive analysis of sleep patterns and send notifications about the number of hours the user has used the phone and its impact on the general health of the eyes and brain. These analyses can motivate the user to improve their sleep patterns. As for the results of heart rate monitoring, the highest response from respondents was “agree,” at 42%.

Smartwatches provide instant and periodic measurements of heart rate, which helps users monitor the regularity of their heartbeats throughout the day. The feeling that there is a device that continuously monitors the heart rate gives a sense of reassurance about the health of the heart, especially for users who suffer from heart health problems, thus increasing awareness of their health condition. As for the level of improvement in the step counter, 48% of respondents answered with “strongly agree,” reflecting the positive impact of smartwatches in increasing awareness of the importance of physical activity. Concerning the percentage of calories burned, the result of “strongly agree” was equal to 43%, due to the increased awareness of the importance of health and the motivation of smartwatches to exercise through their ability to calculate burning rates during exercise, which motivates users to reach the targeted number of calories burned daily.

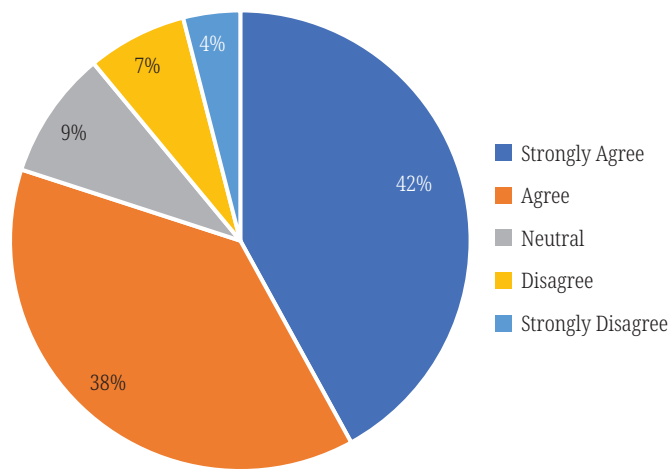


Fig. 3. Usefulness of smartwatches for respondents

Figure 3 shows that most respondents found smartwatches useful for improving health, primarily through tracking vital signs and increasing physical activity. However, a small minority had a negative experience, possibly due to their lack of commitment to using the device for health-related purposes or their skepticism regarding its effectiveness.

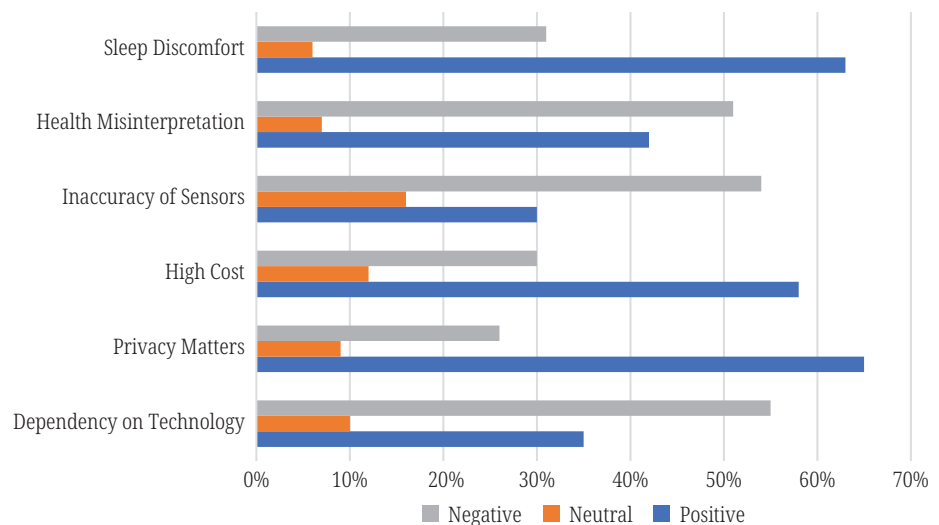


Fig. 4. Determinants faced by smartwatch users for respondents

In Figure 4, the survey results regarding the challenges that respondents may face when using smartwatches on a permanent or semi-permanent basis. To analyze the survey results, a 3-point Likert scale was used, which includes agree, neutral, and disagree [30].

When asked about users' discomfort with the smartwatch when using it during sleep, 63% of users answered "agree." This indicates that there is a noticeable problem in the user experience, and this result may benefit smartwatch developers by working on a more comfortable design during sleep.

As for the misinterpretation of health, 42% of users answered "agree." This is explained by the fact that users' confidence in the results of measuring vital signs provided by the smartwatch is not high enough, which leads to a misunderstanding of the health status, perhaps due to inaccurate readings compared to medical devices. When asked about the inaccuracy of sensors, 30% of respondents answered "agree," which reflects concerns about the measurements of these sensors, possibly due to factors that affect the accuracy of measuring these sensors, such as sweating on the wrist, or during exercise and with increased body movement. This result shows the need to work on enhancing the accuracy of these sensors in measuring vital signs. In the question about the high cost, 58% of respondents agreed, which reflects a clear concern about the prices of smartwatches compared to their features. This percentage indicates that more than half of the participants believe that the cost of purchasing smartwatches could be an obstacle to adopting this technology despite its health benefits. A large percentage, 65%, of participants raised concerns about their privacy regarding the collection of personal and health data through smartwatches. This concern seems to stem from a perceived lack of control over their data and how it is shared, as well as the fear that their information might be monitored without their consent—whether for health purposes or marketing.

To address these issues, smartwatch manufacturers could consider implementing clearer and more transparent privacy policies. Furthermore, 35% of participants expressed concerns about becoming too reliant on technology. Some are worried that excessive dependence on devices might hinder their ability to make well-informed health decisions or reduce their involvement in managing their health. While participants acknowledged their reliance on technology, they expressed a preference for avoiding its overuse.

5 DISCUSSION

This study was intended to explore the effects of smart watch use on advancing health behaviors for members of Jordanian society, with the emphasis on the processes of continuous monitoring of vital signs. The results showed that smart watch use impacts the health behaviors of users; users showed improvements in sleep time, heart rate, and physical activity. The results align with numerous studies in the literature that suggest wearable technology, especially smart watches, can be an important tool in promoting healthy lifestyles.

One of the interesting findings in this study was a change in average sleep duration, from 5.5 hours per day to seven hours per day when participants utilized their smartwatches. This difference was statistically significant according to a paired t-test ($p < 0.05$) as shown in Table 2. The p-value showed that the change in sleep duration was unlikely to have happened by chance alone and implies that smartwatches may positively influence sleep behavior.

The improvement in heart rate reported in this study, in which participants' average heart rate was reduced from 80 bpm to 70 bpm, lends further support to the

idea that wearable devices that measure stress and breathing exercises positively impact cardiovascular health. This finding was also statistically significant ($p < 0.05$) as shown in Table 2. The importance of this finding further solidifies the argument that continuous health tracking through smartwatches can lead to tangible health improvements, especially in regards to stress management and heart health.

In terms of physical activity, the participants reported a meaningful increase in daily steps from an average of 2,000 steps per day to an average of 5,000 steps per day. The paired t-test indicated that this was a statistically significant increase ($p < 0.01$) shown in Table 2. The increase in steps may be related to the reminder features and goal settings associated with the smartwatch, which could encourage individuals to do more physical activity. These results are indicative of wearables to assist in regular physical activity and support the usefulness of these devices for people who are seeking to make modifications to their behaviors in the area of physical health.

Furthermore, the study concluded that the female participants were more likely than males to use smartwatches, and this could be explained by a greater interest in the health-tracking functions of smartwatches. This may be the use of health-related technology by gender, as women have shown greater interest in tracking health indicators such as heart rates, sleep, and stress levels. In addition, the mean age of the sample was 24 (ages 17–27), which implies that the younger group of people has a higher sense of technological competence. Regarding the sample of younger people, their sense of health awareness and exposure to new technology affect their experience with wearable technology.

While the findings support a positive association between smartwatches and improving health behaviors, user challenges were identified. Many respondents reported discomfort while wearing the device while sleeping, which limited their future use of smartwatches. Further, privacy and confidence in the accuracy of health information provided by smartwatches were a concern among respondents, with many respondents wondering how the measurements compared to only using a standard medical device. These suggest that the wearables' accuracy could be improved, but user trust in the devices could be improved as well through ongoing and continued advancements in sensor technology.

In addition, privacy concerns were a prominent issue, with 65% of participants experiencing some level of discomfort with the thought of their health data being collected and shared, which represents broader conversations about data privacy in digital health contexts. As more devices gather sensitive personal health data, users express concern with what's done with their data, therefore, awareness of privacy issues and subsequent practices of transparency and user consent will be important for the sustainable implementation of wearable health technology moving forward.

Although challenges remain, the findings support the important role of wearable health technologies in altering and influencing healthier lifestyle behaviors. Smartwatches can provide real-time feedback and tailored health recommendations, and they can be potential motivational agents for lifestyle modifications. However, improvements in user comfort, the reliability of sensors, and privacy protection will need to be addressed to support long-term usage and satisfaction with the use of wearable technologies.

The results of this study align with earlier studies that examined the positive influences that the use of wearable technology can have on a healthier lifestyle, particularly regarding sleep and physical activity [31]. Nevertheless, this study contributes new insights by focusing on the Jordanian context in which there has been very limited research in this area. This context provides important insight into the cultural and socio-economic factors that may impact smartwatch use and health behavior change in the Middle East.

6 CONCLUSION

This study investigated the impact of smartwatch use on health behaviors, focusing on the monitoring of heart rate, sleep patterns, step count, and calories burned. The findings confirm that smartwatch usage leads to significant improvements in sleep duration, heart rate stability, physical activity, and calorie expenditure. These results underscore the potential of smartwatches to positively influence health outcomes and encourage healthier lifestyle choices. However, the study also identified several challenges, including sensor inaccuracy, privacy concerns, and discomfort when using the device during sleep. These challenges need to be addressed to ensure broader adoption and continued engagement with wearable health technology. Specifically, improving sensor accuracy will enhance user confidence in the data provided by the device, while privacy concerns highlight the need for more transparent data security practices. Additionally, addressing comfort issues associated with wearing the smartwatch during sleep can help increase user compliance and satisfaction. In light of these findings, it is recommended that manufacturers focus on enhancing sensor performance, reducing costs, and strengthening privacy protections. Future research should investigate the long-term effects of smartwatch use on physical and neurological health, as well as explore how these devices can be integrated into preventive healthcare strategies and chronic disease management.

7 REFERENCES

- [1] E. Loos and L. Ivan, "Not only people are getting old, the new media are too: Technology generations and the changes in new media use," *New Media & Society*, vol. 26, no. 6, pp. 3588–3613, 2022. <https://doi.org/10.1177/14614448221101783>
- [2] A. Shaheen, W. Alzyadat, A. Al-Shaikh, and A. Alhroob, "Wearable processors architecture: A comprehensive analysis of 64-bit ARM processors," *International Journal of Interactive Mobile Technologies (ijIM)*, vol. 18, no. 13, pp. 82–95, 2024. <https://doi.org/10.3991/ijim.v18i13.49153>
- [3] M. H. Habaebi, N. S. Kosnin, S. F. Yousif Hasan, and Md. R. Islam, "LoRaWAN monitoring system for emergency vital signs in Pusu River," *International Journal of Interactive Mobile Technologies (ijIM)*, vol. 16, no. 15, pp. 93–111, 2022. <https://doi.org/10.3991/ijim.v16i15.30117>
- [4] A. H. Alsswey, H. Al-Samarraie, F. A. El-Qirem, A. I. Alzahrani, and O. Alfarraj, "Culture in the design of mHealth UI: An effort to increase acceptance among culturally specific groups," *The Electronic Library*, vol. 38, no. 2, pp. 257–272, 2020. <https://doi.org/10.1108/EL-04-2019-0097>
- [5] J. Kaue, G. Smith, D. Prytherch, M. Parr, A. Flabouris, and K. Hillman, "A comparison of antecedents to cardiac arrests, deaths and emergency intensive care admissions in Australia and New Zealand, and the United Kingdom—the ACADEMIA study," *Resuscitation*, vol. 62, no. 3, pp. 275–282, 2004. <https://doi.org/10.1016/j.resuscitation.2004.05.016>
- [6] M. Buist, S. Bernard, T. V. Nguyen, G. Moore, and J. Anderson, "Association between clinically abnormal observations and subsequent in-hospital mortality: A prospective study," *Resuscitation*, vol. 62, no. 2, pp. 137–141, 2004. <https://doi.org/10.1016/j.resuscitation.2004.03.005>
- [7] V. Dudarev, O. Barral, C. Zhang, G. Davis, and J. T. Enns, "On the reliability of wearable technology: A tutorial on measuring heart rate and heart rate variability in the wild," *Sensors*, vol. 23, no. 13, p. 5863, 2023. <https://doi.org/10.3390/s23135863>

- [8] K. Al-Talafhah, F. Aplop, A. Al-Yousef, M. Obiedat, and M. Khazaaleh, "Predictive big data analytics capability model to enhancing healthcare organization performance," *International Journal of Advances in Soft Computing and its Applications*, vol. 16, no. 3, pp. 149–165, 2024. <https://doi.org/10.15849/IJASCA.241130.09>
- [9] M. A. Al Khaldy, A. Shaheen, A. Al-Shaikh, W. Alzyadat, and A. Alhroob, "Android Application for children to learn Arabic alphabets and numbers," *Int. J. Interact. Mob. Technol.*, vol. 19, no. 5, pp. 115–127, 2025. <https://doi.org/10.3991/ijim.v19i05.52695>
- [10] K. Wark, R. B. Woodbury, S. LaBrie, J. Trainor, M. Freeman, and J. P. Avey, "Engaging stakeholders in social determinants of health quality improvement efforts," *The Permanente Journal*, vol. 26, no. 4, pp. 1–11, 2022. <https://doi.org/10.7812/TPP/22.035>
- [11] T. Kanan, M. Elbes, A. Khulood, and M. Maria, "Exploring the potential of IoT-based learning environments in education," *International Journal of Advances in Soft Computing and its Application*, vol. 15, pp. 166–178, 2023. <https://www.i-csrs.org/Volumes/ijasca/IJASCA.230720.11.pdf>
- [12] D. Dias and J. Paulo Silva Cunha, "Wearable health devices—Vital sign monitoring, systems and technologies," *Sensors*, vol. 18, no. 8, p. 2414, 2018. <https://doi.org/10.3390/s18082414>
- [13] L. Sandy, A. Putra, E. Kusumawardhani, and V. Gunawan, "Television transmitter relay performance monitoring system based on the Internet of Things and the MQTT protocol: A case study," *Int. J. Advance Soft Compu. Appl.*, vol. 15, no. 3, pp. 84–99, 2023. <https://ijasca.zuj.edu.jo/PapersUploaded/2023.3.6.pdf>
- [14] C. Perezcampos Mayoral *et al.*, "Fiber optic sensors for vital signs monitoring. A review of its practicality in the health field," *Biosensors*, vol. 11, no. 2, p. 58, 2021. <https://doi.org/10.3390/bios11020058>
- [15] C. Virginia Anikwe *et al.*, "Mobile and wearable sensors for data-driven health monitoring system: State-of-the-art and future prospect," *Expert Systems with Applications*, vol. 202, p. 117362, 2022. <https://doi.org/10.1016/j.eswa.2022.117362>
- [16] R. Ramezani, M. Cao, A. Earthperson, and A. Naeim, "Developing a smartwatch-based healthcare application: Notes to consider," *Sensors*, vol. 23, no. 15, p. 6652, 2023. <https://doi.org/10.3390/s23156652>
- [17] S. Huhn *et al.*, "The impact of wearable technologies in health research: Scoping review," *JMIR mHealth and uHealth*, vol. 10, no. 1, p. e34384, 2022. <https://doi.org/10.2196/34384>
- [18] D. De *et al.*, "Economic perspective of the use of wearables in health care: A systematic Review," *Mayo Clinic Proceedings. Digital health*, vol. 2, no. 3, pp. 299–317, 2024. <https://doi.org/10.1016/j.mcpdig.2024.05.003>
- [19] Y. Xie *et al.*, "Integration of artificial intelligence, blockchain, and wearable technology for chronic disease management: A new paradigm in smart healthcare," *Current Medical Science*, vol. 41, pp. 1123–1133, 2021. <https://doi.org/10.1007/s11596-021-2485-0>
- [20] H. S. Kang and M. Exworthy, "Wearing the future—Wearables to empower users to take greater responsibility for their health and care: Scoping review," *JMIR mHealth and uHealth*, vol. 10, no. 7, pp. 1–16, 2022. <https://doi.org/10.2196/35684>
- [21] C. Del-Valle-Soto *et al.*, "A comprehensive review of behavior change techniques in wearables and IoT: Implications for health and well-being," *Sensors*, vol. 24, no. 8, p. 2429, 2024. <https://doi.org/10.3390/s24082429>
- [22] C.-C. Lin, F.-W. Tung, and C.-H. Chen, "Exploring user engagement with smartwatch health services: A comparative study between Taiwan and Singapore," in *Cross-Cultural Design. HCII 2024*, in Lecture Notes in Computer Science, Rau and PL.P. Rau, Eds., Springer, Cham, vol. 14700, 2024, pp. 99–114. https://doi.org/10.1007/978-3-031-60901-5_8
- [23] M. B. Ghafour and H. Dler Salih, "Smart healthcare monitoring system using IoT," *International Journal of Interactive Mobile Technologies (ijIM)*, vol. 17, no. 1, pp. 141–152, 2023. <https://doi.org/10.3991/ijim.v17i01.34675>

- [24] N. Aljohani and M. N. Alanazi, "Influence of health interests and technological trends on the acceptance of wearable technologies and their applications in Saudi Arabia," *International Journal of Interactive Mobile Technologies (ijIM)*, vol. 19, no. 4, pp. 148–165, 2025. <https://doi.org/10.3991/ijim.v19i04.51099>
- [25] L. Arvai, "Application of smartwatches in elderly care with indoor localization functionality," *International Journal of Interactive Mobile Technologies (ijIM)*, vol. 15, no. 5, pp. 174–186, 2021. <https://doi.org/10.3991/ijim.v15i05.20435>
- [26] A. Al-Shaikh, A. Shaheen, M. Rasmi Al-Mousa, K. Alqawasmi, A. S. Al Sherideh, and H. Khattab, "A comparative study on the performance of 64-bit ARM processors," *Int. J. Interact. Mob. Technol.*, vol. 17, no. 13, pp. 94–113, 2023. <https://doi.org/10.3991/ijim.v17i13.39395>
- [27] H. Huang, "Statistics reform: Practitioner's perspective," *AppliedMath*, vol. 5, no. 2, p. 49, 2025. <https://doi.org/10.3390/appliedmath5020049>
- [28] Department of Statistics, Jordan, "Population," 2024. [Online]. Available: <https://dosweb.dos.gov.jo/>
- [29] M. Kaptein, "A practical approach to sample size calculation for fixed populations," *Contemporary Clinical Trials Communications*, vol. 14, p. 100339, 2019. <https://doi.org/10.1016/j.conctc.2019.100339>
- [30] L. South, D. Saffo, O. Vitek, C. Dunne, and M. A. Borkin, "Effective use of likert scales in visualization evaluations: A systematic review," *Computer Graphics Forum*, vol. 41, no. 3, pp. 43–55, 2022. <https://doi.org/10.1111/cgf.14521>
- [31] A. V. Creaser, J. Hall, S. Costa, D. D. Bingham, and S. A. Clemes, "Exploring families' acceptance of wearable activity trackers: A mixed-methods study," *International Journal of Environmental Research and Public Health*, vol. 19, no. 6, p. 3472, 2022. <https://doi.org/10.3390/ijerph19063472>

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