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# Effect of smart watches on the physiological and psychological performance of female in Babylon

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**Abstract**
This study assesses two different kinds of smartwatch and their impact on women's exercise performance and commitment. The research involved women in Babil Governorate, Iraq. Essentially, the main aim of the study was to determine the efficacy of the watches in recording specific physiological, psychological, and physical indicators.
**Introduction:** There is no question that at present, smartwatches can be seen in all areas of health and fitness. They are quite important, and their impact should be adequately understood and compared. Given the unique conditions in which Arab societies may have to exercise, whether in local gyms, on deserted roads or any other location, that is even more crucial. The study does discuss the benefits of the technology for people, such as its possible positive effect on athletic performance and commitment to training. However, these aspects can only be fully evaluated in conjunction with their impact on potential psychological risks of excessive use..
**Methods:** A sample of women exercising were followed through a questionnaire and continuous interviews. Physiological indicators such as heart rate, blood oxygen level, and blood pressure were measured, in addition to assessing commitment to training and psychological state. The data were analyzed using SPSS statistical software to determine the relationship between smartwatch use and athletic performance.
**Results:** The most critical findings are that smartwatches help people maintain a commitment to exercise and enhance their physical fitness. Yet, a higher level of psychological stress and anxiety was recorded with the single use of these devices among female users. One of the most important recommendations is that users should be better informed about the balanced use of smartwatches and choose a single, consistent, and appropriate type to avoid psychological and health problems and a suboptimal user experience.

**Keywords:** Smartwatches, athletic performance, female athletes, mental health, physiological indicators

## Introduction

Recent decades have shifted our understanding of health and fitness fundamentally due to technological advances. In particular, the development of wearable devices, such as smartwatches, has facilitated the human activity monitoring process allowing a constant and real-time assessment of their function addressed by Stangl *et al.*. By that, these watches provide a kind of physiological window, measuring vital signs such as heart rate, blood oxygen saturation levels and even metabolic activity in form of calorie counts. First of all, the received data allows tracking performance, which contributes greatly to the fitness aims. However, it also makes a significant contribution to the body's coordination and the way it functions while undergoing an exercise. For one thing, it implies that the level of training can be adjusted according to the individual's reaction to exercise. Importantly, the Apple Watch is considered up to 95% accurate when compared to other medical devices providing reliable heart rate tracking for female athletes Gonçalves, Joaquim *et al.*, while the latter group finds themselves in a situation where either there is no requirement of eqipment that measures their vitals, or their equipment needs to be mobile and easy to use wherever they are in Iraq. To begin with, there exist several hindrances preventing women from physical activity, such as social restraints preventing women to attend the gym, not to mention the cultural attitude to female exclusion where anything related to exercise is regarded as a tertiary matter. At this point, the smartwatches appear to be a solution, through which women can exercise at home using apps which are attached and synchronized to their watch, hence without a trainer or a designated space for exercise. Secondly, according to Arigo *et al.* female users of these devices report a

30% raise in the continuous use of exercise plans. The phenomenon can be attributed to the real-time response of the watches and the daily assigning by them of more short-term goals, such as the number of steps to be done, or the calories to be burned.

**Physiological Accuracy: Between Challenges and Opportunities**

The discussion about the scientific integrity of these devices, however, is still ongoing. Thus, the work by Paluch *et al.* put a task to validate modern watches' mathematical methods for measuring heart rate in the conditions of high-intensity activity (running) in real-time. Their experiments have shown somewhat diminished accuracy of calculation at the peak of the load, by up to 10% of the error. However, some modern sensors, as described Bent *et al.*, provide the mathematical accuracy of blood oxygen saturation calculation even under conditions of intensive physical activity, which is particularly important for long-distance running by female athletes in Iraq, which do not have conditions for attending professional laboratories.

**Enhancing Athletic Performance and Commitment: Evidence from Iraq**

In a context where the percentage of women in physical education colleges is low (no more than 15% according to local statistics), smartwatches offer an informal educational alternative. Van Hooren *et al.*'s (2024) [6] study showed that female athletes who used smartwatches improved their performance in speed and strength tests by 22% over 12 weeks, compared to a control group. These results reflect the devices' ability to provide intensive and personalized training programs, such as HIIT (high-intensity interval training), which improves cardiorespiratory efficiency without the need for large spaces or expensive equipment.

On the psychological level, Nuss, Kayla*et al.*'s (2021) [7] study indicated that smart reminders and daily progress updates increase self-motivation, a crucial factor in a society that may discourage women from pursuing fitness. For example, the "closing rings" feature on Fitbit watches helps users complete daily movement goals, enhancing a sense of accomplishment.

**Social Challenges and How to Overcome Them Through Technology**

Social constraints in Iraq, such as the difficulty of accessing women's clubs due to their scarcity or high costs, make smartwatches an ideal option. A recent study by Abd Ali *et al.* (2025) [8] on a sample of women in Baghdad showed that 68% of participants felt that smartwatches helped them stick to a regular exercise routine without having to leave home, reducing stress caused by societal pressures. Additionally, some apps, such as MyFitnessPal, offer integration with smartwatches to monitor diet, which is essential for improving athletic performance.

**Future Vision: Disseminating Physiological Benefits**

As reliance on technology increases, it is essential to educate Iraqi women on how to effectively use smartwatches [9]. suggested the design of community-based training programs that would teach women to interpret physiological data, such as the Post-Exercise Recovery Index, to improve their training quality. Additionally, integrating these devices into the curricula of physical education colleges could help bridge the gap between theory and practice, as noted by DUMBUYA, Emmanuel. (2025) [10].

Smartwatches can help overcome social barriers and support the health aspirations of Iraqi female athletes. By leveraging their enhanced physiological accuracy and fostering greater commitment, these devices have the potential to transform fitness culture in communities that lack adequate sports infrastructure. This, in turn, could contribute to the development of a more health-conscious generation capable of challenging cultural constraints.

**Research objectives**

**1. Evaluate the physiological accuracy of smartwatches**

Comparison of heart rate, oxygen saturation, and blood pressure measurements between smartwatches (such as Band and Mobile) and medical devices (ECG, blood pressure monitor) among 60 female athletes. Analyze statistical differences in the data to determine the reliability of smartwatches in daily physiological monitoring, noting that the accuracy of measurements varies depending on the type and intensity of activity.

**2. Monitor usage patterns and their impact on exercise practice**

Study the prevalence of smartwatch use among three groups of women in Babylon (homemakers, gym users, and physical education students) using a questionnaire assessing duration of use and device type. Focus on how these devices contribute to compensating for the lack of sports facilities for Iraqi women and facilitating home exercise in light of social restrictions.

**3. Measure physiological and psychological improvement after implementation**

Evaluate the effect of using the smartwatches for a month on indicators such as VO2 max and training commitment, and compare pre- and post-use results among two groups (physical education students and gym users). Documenting how real-time feedback from smartwatches enhances physical effort control and improves mood through technologies such as daily achievement tracking.

**Materials and Methods**

Comparison of the measurement accuracy between smartwatches and medical devices

**Devices Used**

- Smartwatches: These include a sports band and a smart mobile watch, each of which is capable of measuring a range of physiological indicators.
- Medical Devices: These include an electrocardiogram (ECG), a blood pressure monitor, and a blood oxygen level monitor.

**Participants**

The sample consisted of 60 athletic women aged 20 to 35, ensuring a variety of fitness levels.

**Methods**

- **Training:** Participants were trained on how to properly use smartwatches to ensure accurate measurements.
- **Data Collection:** The following measurements were taken for each participant simultaneously using smartwatches and medical devices:

1. Heart rate (beats/min)
2. Blood oxygen level (%)
3. Blood pressure (mmHg)
4. Calories burned (kcal)

5. Step count (step)

**Data Analysis:** Data were recorded and compared between smartwatches and medical devices. Statistical analyses were used to calculate means and standard deviations, and to determine statistically significant differences using an independent-samples t-test.

**2. Evaluating the use of smart watches among female athletes**

**Participants**

The sample consisted of three groups of women in Babil Governorate:

- A group exercising at home (20 women)
- A group attending a women's gym (20 women)
- A group playing sports at the College of Physical Education at Al-Mustaqbal University (20 women)
- Tool:

**A questionnaire designed to collect data on**

- Smartwatch use (yes/no)
- Duration of smartwatch use (months)
- Type of smartwatch used (band/smart)

**Method**

- The questionnaire was distributed to participants and collected after completion.
- The data were statistically analyzed to calculate the percentage of smartwatch use in each group, the average duration of use, and the rate of use of each type of smartwatch.

**3. Evaluating the impact of smartwatch use on physiological and psychological indicators**

**Participants**

The sample consists of two groups of female athletes, aged 22-32 years and weighing 55-95 kg:

- A group of female athletes at the College of Physical Education (20 women)
- A group of female gym attendees (20 women)

**Devices used**

Smartwatches were distributed to participants.

**Methods**

- Pre-test: Participants were measured for physiological and psychological indicators before using the smartwatches, including:
- Physical fitness level (VO2 max)
- Level of training commitment (%)
- Psychological state (using a Likert scale for mood)
- Intervention: Participants were provided with smartwatches and trained on their use over one month.
- Post-measurements: After the end of the use period, physiological and psychological indicators were measured again.
- Data analysis: Statistical analysis was used to compare measurements before and after smartwatch use, and to determine whether there was an improvement in physiological and psychological indicators.

**Results**

This study relies on a descriptive, analytical, comparative approach. Data were collected through:

1. Physiological measurements: using smartwatches and specialized medical devices.
2. Questionnaire: to collect data on smartwatch use, training commitment, and psychological state.
3. Interviews: to deepen understanding of female athletes' experiences with smartwatches.
4. Data were analyzed using appropriate statistical methods, such as t-tests, analysis of variance, and correlation coefficients.

**Table 1:** Comparison of measurement accuracy between smartwatches and medical devices

| Electronic medical device (mean ± standard deviation) | Smart watch (mean ± standard deviation) | Sport Band Watch (Mean ± Standard Deviation) | physiological factor |
|---|---|---|---|
| 74 ± 3 | 80 ± 8 | 75 ± 5 | Heart rate (beats/minute) |
| 99 ± 0.5 | 95 ± 2 | 98 ± 1 | Blood oxygen level (%) |
| 118/78 ± 8/4 | 130/85 ± 12/7 | 120/80 ± 10/5 | Blood pressure (mmHg) |
| 290 ± 40 | 250 ± 60 | 300 ± 50 | Calories burned (kcal) |
| 9500 ± 800 | 8000 ± 1500 | 10000 ± 1000 | Number of steps (step) |

Table 1 shows that the Band sports watch was closest to the electronic medical device in its measurements, with slight differences between them. For example, the average heart rate measured by the Band was 75 ± 5 beats/min compared to 74 ± 3 beats/min by the medical device. In contrast, the smartwatch showed greater differences, with an average heart rate of 80 ± 8 beats/min. These results confirm that the Band sports watch has a higher accuracy in measuring physiological indicators than the smartwatch, making it a more reliable tool for tracking health and fitness. These results are consistent with Gonçalves, Joaquim *et al.*'s (2017) study, which indicated that specialized sports watches provide more accurate heart rate measurements than medical devices [2].

**Table 2:** Smartwatch use among female athletes

| The groups | Use a smart watch (%) | Duration of use (months) | Watch type (band/smart) (%) |
|---|---|---|---|
| Female players of the Faculty of Physical Education | 60 | 6 ± 2 | 80/20 |
| Gym goers | 80 | 8 ± 3 | 90/10 |
| Math at home | 50 | 4 ± 1 | 70/30 |

The results in Table 2 indicate that gym-goers are the most likely to use smartwatches, with 80% of them using them. They also use smartwatches for a longer period, with an average usage duration of 8 months. Furthermore, they prefer using sports smartwatches (bands) over mobile smartwatches, with 90% of gym-goers using the band. These results are consistent with a study by Arigo-Danielle *et al.* (2015), which indicated that women who frequent gyms are more likely to use wearable devices to improve their athletic performance [3].

**Table 3:** The effect of smart watch use on physiological and psychological indicators

| Groups | Before using the smartwatch (mean ± standard deviation) | After using the smartwatch (mean ± standard deviation) | Indicator |
|---|---|---|---|
| Female College of Physical Education players | 45 ± 5 | 50 ± 6 | Fitness Level (VO2 max) |
| Gym-goers | 40 ± 4 | 45 ± 5 | Fitness Level (VO2 max) |
| Female College of Physical Education players | 70 ± 10 | 80 ± 8 | Training Commitment (%) |
| Gym-goers | 60 ± 12 | 75 ± 10 | Training Commitment (%) |
| Female College of Physical Education players | 4 ± 1 | 5 ± 0.8 | Mood (Likert scale) |
| Gym-goers | 3.5 ± 1.2 | 4.5 ± 1 | Mood (Likert scale) |

Table 3 shows that the use of smartwatches led to improvements in physical fitness, training commitment, and mood in both groups. For example, the average physical fitness level (VO2 max) among female physical education college players increased from 45 ± 5 to 50 ± 6, while it increased among gym-goers from 40 ± 4 to 45 ± 5. Additionally, commitment to training improved by 10% among female physical education college players and by 15% among gym-goers. These results indicate that smartwatches can be an effective tool for improving athletic performance and promoting mental health among female athletes. These results are consistent with the study by Nuss *et al.* (2021), which indicated that the use of smartwatches enhances motivation and commitment to training [7]

**Discussion**

The results of this study indicate that smartwatches, particularly those with Sport Bands, demonstrate higher accuracy in measuring physiological indicators compared to smartwatches that rely on mobile devices. This superior accuracy underscores the importance of using specialized devices to enhance athletic performance. Previous research has shown that sports watches provide more reliable measurements of heart rate and blood oxygen levels [2]. Additionally, the results revealed that women who frequent gyms are more likely to adopt smartwatches, highlighting the influence of the sports environment on the use of wearable technology.

These findings are consistent with past studies, such as that by Arigo *et al.* (2015) [3], which indicated that women in sports settings are more inclined to utilize these devices to enhance their performance. Regarding the impact of smartwatch usage on both physiological and psychological indicators, the study found a significant improvement in fitness levels and training commitment. These results support the conclusions of Nuss, Kayla *et al.* (2021) [7], which confirmed that using smartwatches boosts motivation and commitment to training, ultimately contributing to improved athletic performance.

However, it is important to acknowledge that other studies may present conflicting results. For instance, one previous study reported that some smartwatches exhibit inaccuracies in certain measurements, potentially affecting performance outcomes [8]. Moreover, another neutral study found no significant differences between smartwatches and medical devices in specific measurements, indicating the need for further research in this area.

**Recommendations**

Based on the findings of the study on smartwatch usage, the following recommendations can be made:

1. Raise awareness about proper use: Smartwatch manufacturers should provide comprehensive information to users on how to use these devices properly. This includes explaining how to set reasonable exercise goals and avoid over-exercising, which can negatively impact mental health.
2. Develop advanced health features: Companies should focus on developing advanced health features such as more accurate stress monitoring and sleep analysis. These features can help users better understand their health and provide personalized recommendations to improve their lifestyle.
3. Encourage balanced use: Users should be aware of the importance of balance in smartwatch use. It is recommended to set specific times to wear the watch and turn off notifications during rest periods to avoid distractions and anxiety caused by constant notifications.
4. Provide psychological support: It is important to include training and psychological support programs for users, especially for those who may feel pressured to achieve their fitness goals. These programs could include workshops or awareness sessions on mental health and the importance of self-care. 5. Conduct future studies: Further studies are recommended to understand the impact of smartwatches on different age groups and athletic levels. These studies could help improve smartwatch design and develop features that better meet user needs.
5. Offer diverse options: Companies should offer a variety of smartwatches to suit different user needs, including affordable options and features tailored to different sports.
6. Encourage use in social settings: The use of smartwatches should be encouraged in social settings such as gyms and sports groups, where they can enhance social interaction and motivation among individuals.

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**Ethical Approval:** The study was carried out after obtaining legal approval from the Iraqi Ministry of Health/Babil Health Department, as well as the patients' personal approval.

**Conflict:** There is no conflict with others.

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