



UNIVERSITY  
OF  
LOUISIANA  
L a f a y e t t e

# How Accurate Are the Apple Watches?

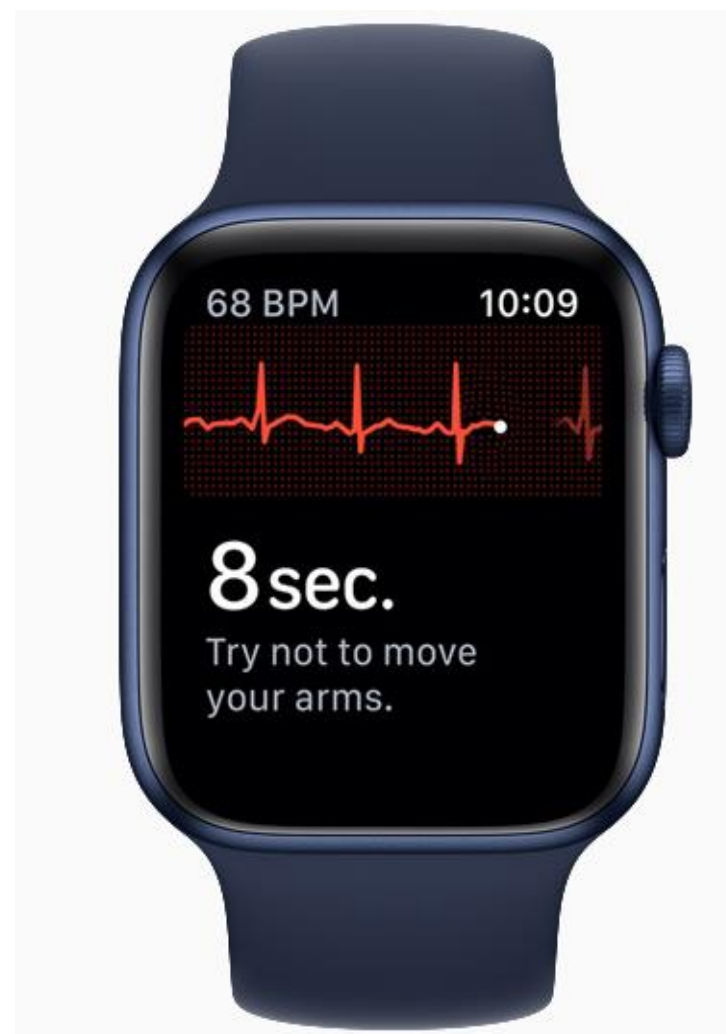
Haylee M. Holt, Aimee Gros, Shuichi Sato

School of Kinesiology, University of Louisiana at Lafayette, Lafayette, LA

University of  
Louisiana at  
Lafayette

## Background

The Apple Watch (AW) is a commercially available device that provides cardiovascular and physiological data.



The image is taken from:  
<https://apple.com/au/newsroom/2021/05/ecg-app-and-irregular-rhythm-notification-now-available-on-apple-watch/>

Many people rely on the Apple Watch to greatly assist in medical issues such as high and low heart rates, irregular heart rhythm, and atrial fibrillation (AFib). They put trust into this device, and if it fails, they could be at risk. In this study, researchers aim to test how accurate the Series 9 Apple Watch really is, and how much trust can be put into it. Researchers aim to determine the accuracy of heart rate data collected by the Apple Watch at rest and during exercise, when compared to a standard COSMED ECG system. There have been similar studies conducted previously, but most of them focused specifically on certain diseases such as hypertension and diabetes. In this study, investigators will use healthy, strong individuals from the ages of 18-30.

• *Key Words: Apple Watch, Accuracy, Heart Rate*

## Purpose

The purpose of this research is to determine exactly how accurate the Apple Watch is when collecting heart rate data at rest and during exercise. This research is vital to the approximately 115 million everyday Apple Watch users in order to ensure they are seeking medical attention when necessary during certain cardiovascular issues. If the Apple Watch proves to be inaccurate, certain users that rely on these specific functions in their everyday life would then be able to find a more accurate solution.

## Hypothesis

Investigators hypothesize that the Apple Watch will provide data comparable to that of the standard ECG system, making it a valuable tool for estimating cardiac and physiological conditions in various settings.

## Anticipated Results

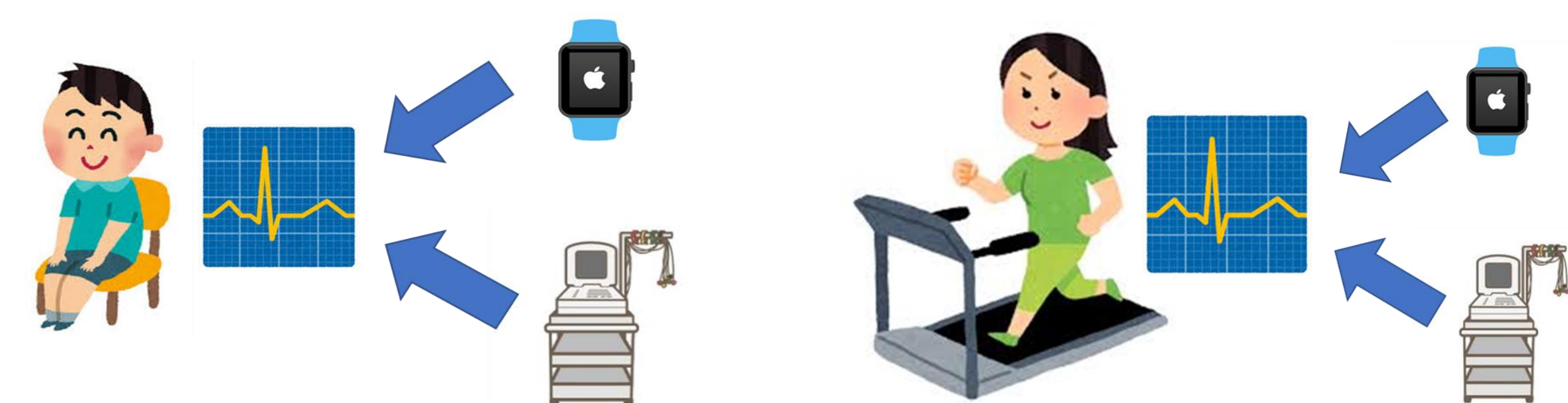
Researchers anticipate that our results for both the Apple Watch and the standard ECG in both the exercise and resting portion of the experiment will be similar, if not the same. When analyzing the results of the exercise portion specifically, investigators expect to see the same climbs in heart rate as the incline increases during each stage. Changing the incline at each stage is vital in catching these exact moments where there could possibly be a spike in their heart rate, ensuring that both the Apple Watch and the COSMED ECG system catch this in their readings.

## Acknowledgements

This study is supported by the Advance Grant from the Student Center for Research, Creativity and Scholarship at the University of Louisiana at Lafayette.

## Methods

The study will use approximately 20 healthy participants (10 males and 10 females). Each will fill out informed consent and complete a PAR-Q survey before the experiment to ensure they are free of cardiovascular problems. The researchers will, then, calculate the age-predicted 60% maximum heart rate for use in the experiment later. For the ECG reading, electrodes will be placed below each clavicle and on both sides of the lower ribcage. In order to collect the resting heart rate, each participant will be seated for 30 seconds while data is recorded simultaneously from the Apple Watch and the standard ECG system. For the exercise portion, the participant will walk on a treadmill at a pace of 3.3 mph and a starting incline of 0. Each stage comprises 1-minute treadmill walking, and the incline increases by 1 degree at the end of each stage. After each stage, we will ask the participant about their perceived exertion (RPE) rate to estimate how hard their body works during exercise (Borg scale: 0-10, with 10 being extremely difficult). The participant will continue through each stage until reaching the calculated 60% of their max heart rate for the entire stage. Once the participant's heart rate reaches 60%, the exercise portion concludes, and we will collect the Apple Watch and ECG data.



## References

- Khushhal, A. A., Mohamed, A. A., & Elsayed, M. E. (2024). Accuracy of Apple Watch to Measure Cardiovascular Indices in Patients with Chronic Diseases: A Cross Sectional Study. *Journal of Multidisciplinary Healthcare*, 17, 1053. <https://doi-org.ezproxypod.ucs.louisiana.edu/10.2147/JMDH.S449071>
- Kobel, M., Kalden, P., Michaelis, A., Markel, F., Mensch, S., Weidenbach, M., & Riede, F. T. (2022). Accuracy of the Apple Watch iECG in Children With and Without Congenital Heart Disease. *Pediatric Cardiology*, 43(1), 191. <https://doi-org.ezproxypod.ucs.louisiana.edu/10.1007/s00246-021-02715-w>
- Seshadri, D.R., et al., Accuracy of Apple Watch for Detection of Atrial Fibrillation. *Circulation*, 2020. 141(8): p. 702-703.