

EYE TRACKING ON
WEARABLE DEVICES:
**MEASURING
USABILITY & USER
ENGAGEMENT**



KEY LIME
INTERACTIVE
Optimize the Experience. Inform Design.

EYE TRACKING ON WEARABLE DEVICES: Measuring Usability & User Engagement

AN EXCITING ARRAY OF NEW SMART WEARABLE DEVICES ARE AVAILABLE TO CONSUMERS, BUT VERY FEW HAVE PROVEN TO BE USEFUL ENOUGH TO BECOME A STAPLE OF OUR DAILY LIVES.



Smartwatches can be used during a workout routine.
Image of Samsung Gear S2 courtesy of Samsung

The wearables experience is very different from that of any other portable device. In the morning a smartwatch might vibrate to get your attention to look at it because you have a meeting in 10 minutes. The device might alert you that you have reached your target heart rate while exercising. The user might then swipe the screen a few times to change to a different song track.

User experience teams have been able to collect lots of data about usage habits through diary studies and run usability tests to understand if users can use these devices. While informative, these methods are unable to capture the subtle, yet critical behavior of visual attentiveness.

Visual attention is still the primary way for users to obtain information from and interact with wearable devices. Users stop, check the device display, interact easily and quickly, and then move on. They spend only seconds in an app at any given time, rather than minutes. By providing just the right information, at just the right time, users can get back to focusing on the real world more quickly.

A poorly designed app requires the user to spend significantly more time looking at the wearable device, which then disrupts the user from their primary task and reduces the overall utility of wearing the device.

The user's interest in engaging with the device can be measured by the frequency with which they look at it. A useful wearable device should be frequently glanced at for short amounts of time, providing bite-sized amounts of information, similar to quick glances at a regular analog watch.

Eye tracking wearable devices

Eye tracking is commonly used in research with desktops, laptops, tablets, and smartphones. The relatively large screen size inherent to these devices permits researchers to understand exactly what interface elements that the user is focusing on.

Unfortunately, wearable screens are just too small to track specific elements. At best, the eye tracker can tell you generally which region (e.g. top left) of the device the user is looking at.

The untapped value of eye tracking for wearables is not necessarily what they are looking at on the device, it is how often and how long they spend looking at it.

Visual attentiveness is key to understanding the UX of wearables

Tracking deliberate attention

The context of use for wearables is highly dependent on the user's goals and context of how the device will be used. Is the user deliberately looking at the device to obtain information (e.g. checking workout performance) or to perform a function (e.g. hailing an Uber)? In these situations, measuring the amount of time required to perform a task is critical to the usability of the app.

Eye tracking is a key component to understand exactly when a user is able to locate the information and how long they need to look at it in order to complete their task.

Most wearables require some interaction with external artifacts.

- **Hand-off between smartwatch and smartphone.**
The Starbucks app requires that the user pay attention to their iPhone so that they can log into their account in order to first pay with their Apple Watch.
- **Connecting with a payment terminal.**
Users must move their watch to within a certain range of a payment terminal in order to initiate a transaction. The user must look back and forth between the terminal and their watch to know when the payment has been completed.

Deliberate visual attention on a wearable device should be measured from the point that the user begins looking at the device to when they look away after completing the task. The metrics for measuring efficiency includes the total fixation count (e.g. how many times they looked at the device) and total fixation duration (e.g. how long they looked at the device).

A primary purpose of any wearable is to augment our abilities by providing timely and highly contextual information.

Tracking unplanned attention

A primary purpose of any wearable is to augment our abilities by providing timely and highly contextual information. Notifications can be provided to remind us of important meetings, alert us to changes in weather at our location, or present a text message from a friend. These notifications are presented without the foreknowledge of the user and are dependent on a combination of visual, auditory, and vibrotactile feedback to get the user's attention.

Eye tracking can help us to identify:

- How quickly does the user notice a new notification?
- How long do they visually attend to the content on the screen?
- How many times do they visually attend to the screen?

The environment and situation that the user is in can also significantly impact their visual attention. Is the user actively engaged in other activities (e.g. on a phone call while checking emails) or passive (e.g. reading a magazine while riding the train)?

Eye tracking technology used to track wearables

Eye tracking glasses are the only way to unobtrusively collect eye tracking data in a real-world setting. Study participants can wear the glasses with total freedom of movement, and anything that the user decides to look at can be seamlessly captured by the eye tracker.

New analysis tools are in the works that can assist researchers to analyze eye tracking data collected during a wearables study. Object recognition software will be able to recognize when the user is looking at a device (e.g. smartwatch, smartphone, etc.) and will be able to automatically calculate the amount of time that the user spends looking at specific objects.

Improving the user experience of wearables

Eye tracking can help researchers to better understand how users are viewing wearables and to identify usability issues that might not be detected by direct observation of participants in a usability test. At Key Lime Interactive, we have been working on new methods for analyzing eye tracking data that are most applicable for studying wearables. Benchmark metrics that we are currently studying include:

- On average, what is a typical amount of time that users look at a smartwatch display?
- How many times does an average user glance at the display in a given period of time?
- What percent of time does the user spend looking at a display vs. interacting with it?
- How long does it take users to notice and visually attend to a notification on their smartwatch?

Our goal is to establish benchmark metrics for a variety of wearable devices and apps so that we can help our clients understand how their products compare and to make suggestions for improving the user's experience. Stay up-to-date on the latest in wearables and other UX topics by subscribing to the Key Lime Interactive newsletter.



Users are required to look at their iPhone to sign into their account before using the app on their Apple Watch.



Eye tracking glasses allow seamless tracking of the user's eye gaze.

Image courtesy of Tobii Technology.



New tools that use object recognition will calculate the amount of time a user looks at certain objects.

Image courtesy of Samsung.



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