**PART 1: Research question and hypothesis**

Research question: Is placing a touch input on the whole smartwatch wristband, including the back of the band, more convenient to users and will it lead to faster and more accurate selection and scrolling compared to the conventional touchscreen interaction?

We hypothesize that our input method can deliver more selection accuracy and faster selection and scrolling speed compared to conventional input method for smartwatches (i.e. display touchscreen) because in our design the finger will be moving along bigger interaction area. Moreover, moving the touch interaction off the screen will allow the user to not block the display screen while interacting with the device.

**PART 2: Apparatus**

[To be added]

**PART 3: Participants**

We will recruit 12 volunteers as participants. There will be 6 males and 6 females in the age range of 20 to 30. The participants will be mixed from graduate and undergraduate students. All of them will be our colleagues from school who are students at our Computer Science Department. While all participants are experts in using smartphones and laptops, some will have previous experience with smartwatches while the rest will have not used a smartwatch before.

**PART 4: Experimental design**

We have two *independent variables*:

* Device
* Task

The Device factor has two *levels*:

* Smartwatch display touchscreen
* Smartwatch sensitive wristband

The Task factor has two *levels*:

* Scrolling
* Selecting

We have two *dependent variables*:

* Speed
* Accuracy

In every *trial*, a participant will use one of the devices (touchscreen or wristband) and attempt to finish one of the functions (selecting or scrolling)

In each trail, we will measure the speed and accuracy of a participant selecting a target on the screen.

Our experiment will have within-subjects design, i.e. all participant will experience all levels in all factors, because it will make the process much more streamlined and less resource heavy. We have limited number of participants and we want to collect as much data as we can for all factors and all levels. Moreover, within-subjects design will allow us to reduce the amount of error arising from natural variance between individuals.

Each participant will have to do 4 trials in this order:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Participants | First trial | Second trial | Third trial | Fourth trial |
| 1-3 | Device: touchscreen  Function: selection | Device: touchscreen  Function: scrolling | Device: wristband  Function: selection | Device: wristband  Function: scrolling |
| 4-6 | Device: touchscreen  Function: scrolling | Device: touchscreen  Function: selection | Device: wristband  Function: scrolling | Device: wristband  Function: selection |
| 7-9 | Device: wristband  Function: selection | Device: wristband  Function: scrolling | Device: wristband  Function: selection | Device: wristband  Function: scrolling |
| 10-12 | Device: wristband  Function: scrolling | Device: wristband  Function: selection | Device: wristband  Function: scrolling | Device: wristband  Function: selection |

**PART 5: Tasks and Procedures**

Step 1: Introduction

* We will introduce the experiment details to the participant verbally and give them written instructions about what will happen in the experiment and all the tasks they will be required to do at each stage.
* Each participant will be asked to answer these questions:
  + Age:
  + Use of smartphone: None Average (calls/SNS/music) Frequently (emails/note taking)
  + Use of smartwatch: None Average (time/calls/music) Frequently (emails/directions)

Step 2: Training

* Each participant will be trained on how to use the wristband and the display touchscreen (if they don’t know already) and will have 5 minutes on their own to explore the devices and adapt to them.

Step 3: Trials

* There will be four trials for each participant and in the order described in PART 4 – Experimental Design.
* For selection task, there will be 12 targets to be selected. A user has to select the back block in color grid of 2X2, 3X3, and 4X4
* For scrolling task, there will be 12 targets to be selected. A user has to navigate a long nested list and select the target.
* There are 2 minutes’ rest time between each trial.
* We project the entire process will take 30 minutes per participant.

Step 4: Filling up a survey

* Every participant will be required to fill up a survey regarding their experience with the two input methods. The survey is described in the following section.

**PART 6: Measures**

We have two *dependent variables*:

* Speed: the time it takes from when a target appears on the screen till the participant selects it
* Accuracy: the number of times a participant selects a non-target from the time when a target appears on the screen till the participant selects the target.

We hypothesize that our input method can deliver more selection accuracy and faster selection and scrolling speed compared to conventional input method for smartwatches. The best way to test this hypothesis is by recording the time it takes a user to select an target object on the screen using both input methods: display touchscreen and the wristband. Moreover, we have to calculate the error rate associated with each input method to assess the reliability of the input tool.

**PART 7: Data collection**

For each trial we will measure speed and accuracy. Our app will have a built-in code to calculate the time from the start of the task until they click the target. The code will also measure the accuracy or error selection rate by identifying how many times an incorrect selection is made.

We will observe personally each participant while using the input method. Each participant will fill up a paper questionnaire at the end of their experiment. The questionnaire will include these questions:

* Which method for selection do you prefer to use: Touchscreen or Wristband
* Which method for scrolling do you prefer to use: Touchscreen or Wristband
* Did using wristband as input method case fatigue? Yes or No
* Comments