

## **Study Protocol - Using Voice and Biofeedback to Predict User Engagement during Requirements Interviews**

This study protocol reports the steps carried out to collect the data for the experiment reported in the paper “*Using Voice and Biofeedback to Predict User Engagement during Requirements Interviews*”, by A. Ferrari, T. Huichapa, P. Spoletini, N. Novielli, D. Fucci and D. Girardi. The protocol reports all the details required to replicate the experiment in a similar setting. Please refer to the original paper for additional details.

### **Preparation**

1. Recruitment
  - a. Participants can be paid;
  - b. Flyer for the participants has to be advertised at the University;
  - c. Advertisement duration: 2 weeks;
  - d. Profile required:
    - i. Students (graduate and undergraduate)
    - ii. Active Facebook users (once a day)
2. Pilot experiment: pilot the set-up and execution steps

### **Set-up**

1. Three **roles**: participant, interviewer, observer
2. A computer, with audio recording capabilities
3. A wrist-band (Empatica E4 Model, <https://www.empatica.com/research/e4/>)
4. A mobile with the wrist-band application
5. Battery charger for all the electronic equipment
6. The **interviewer** performs all the interactions with the participant
7. The **observer** takes notes about the times of each question, and act as assistant
8. Settings:
  - a. Place A: to perform the interview.
  - b. Place B: to perform activities at the computer.
  - c. The interviewer stays in front of the participant.
  - d. The observer stays on the side of the participant.
9. Consent form
10. Questionnaires with:
  - a. unique ID,
  - b. demographic data,
11. Image questionnaire (for calibration), see “Calibration-Questionnaire.pdf”.
12. Interview questionnaire, see questions from file “Interview.pdf”.
13. Self-assessment questionnaire, see file “Self-Assessment-Questionnaire.pdf”.
14. Log Excel file in which the observer writes: participant ID; associated ID of the recorded wristband data.

## Execution

### PHASE 1. Calibration

1. The participant signs the consent form
2. The interviewer explains the experiment to the participant
3. The participant wears the wrist-band
4. The interviewer checks that the wrist-band is correctly communicating with the mobile
5. The participant sits on place B
6. The interviewer explains to the participant that s/he will see a set of images
7. The interviewer tells the participant: I will count until three; at three please press the button of the wristband for less than one second
8. **The participant presses start; the interviewer starts the images; the observer takes the time-stamp.**
9. The observer checks that the wrist-band is not switched off
10. 9 minutes: watch images: three minutes neutral images, three minutes various images, three minutes neutral images. See ElicitationImages.pdf slide deck. Each picture is displayed for 10 seconds, with intervals of five seconds between them to allow the participant to relax.
11. When the interviewer sees that the set of images ended, the interviewer asks the participant: I will count until three; at three please press the button of the wristband for less than one second.
12. **The participant presses the button; the observer takes the time-stamp.**
13. 3 minutes: the interviewer speaks with the participant to make him/her comfortable (e.g., ask about their day, discuss light topics and create a rapport with the person until you see that the person is sufficiently at ease), before the second phase.

The calibration is required to adjust the future valence and arousal scores collected during the self-assessment questionnaire in PHASE 3 (Interview). Specifically, we adjust all valence and arousal scores collected in the interview based on the mean values collected during the calibration phase.

### PHASE 2. Demographic Data and Calibration Questionnaire

1. The participant fills-out a questionnaire with demographic data (DemographicSurvey.pdf)
2. This questionnaire has a unique ID
3. The participant fills-out the questionnaire for calibration

### PHASE 3. Interview

1. The participant moves to place A to perform the interview
2. The interviewer tells the participant: try not to be too short in the answer but to give some argumentation to your answer
3. The interviewer tells the participant: I will count until three; at three please press the button of the wristband for less than one second;
4. **The participant presses start; the observer takes the time-stamp; the interviewer starts the audio recording;**

5. The observer checks that the wristband is not switched off
6. The interviewer starts with the questions
7. Both the interviewer and the observer have the list of questions:
  - a. The list of questions of the observer is structured with: question; space for time-stamps; space for notes.
  - b. For each topic, the interviewer will tell the topic to the participant
  - c. For each question, the observer takes the time-stamp of the question
  - d. For each question, the observer takes notes
8. The interviewer tells the participant: I will count until three; at three, press the button.
- 9. The interviewer stops the recording; the observer takes the time-stamp; the participant presses the button.**
- 10. The interviewer saves the recording with the ID that appears in the questionnaire.**
11. The observer stops the wristband application in the mobile.
12. The observer ensures that the data are uploaded.

#### **PHASE 4. Self-assessment questionnaire**

1. The participant fills out the questionnaire about the questions of the interview (see Self-Assessment-Questionnaire.pdf)

#### **PHASE 5. Closing**

1. The interviewer and observer wrap-up
2. The interviewer takes back the wristband from the participant
3. The interviewer writes in the Log Excel file the ID of the participant, and the ID of the wristband data as they appear in the online application.
4. The observer asks the participant if s/he is available for follow up questions in case needed.
5. The observer downloads the wristband data and save them together with the recording audio file, marked with the same ID used for the questionnaire.
6. The observer backs-up the content in dropbox. The dropbox folder will include:
  - a. A sub-folder with the ID of the participant
  - b. An audio file named with the ID of the participant
  - c. The current Excel file of the questionnaire named with the ID of the participant
  - d. The bio-feedback data in a separate folder.
- 7. Empty the wrist-band memory** (link to a USB, if the computer has the App open)

#### **Attachments**

- DemographicSurvey.pdf
- ElicitationImages.pdf
- Interview.pdf
- Calibration-Questionnaire.pdf
- Self-Assessment-Questionnaire.pdf