

Participant information sheet

Free University of Bozen-Bolzano

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Study Title: *User-centered robot task and motion adaptation in collaborative assembly*

1. WHAT IS THIS DOCUMENT?

This document serves as an information sheet. It will explain to you about this study so that you can make an informed decision about your participation in this research. We encourage you to take some time to read this document and ask questions. If you decide to participate, you will be asked to sign a consent form to acknowledge that you have read and understood the experiment and wish to take part in this scientific study. You will be given a copy of this document for your records.

2. WHAT IS THIS RESEARCH ABOUT?

In this era of industrialization, automation through human-robot collaboration has gained a lot of attention; yet existing technology fails to cater to changing emotional states in human co-workers. We aim to develop an algorithm that changes the robot behavior according to the current arousal level of a user in a jointly performed human-robot assembly task as it strongly correlates with performance and user satisfaction. Robot behavior changes will be reflected through changes in the robot task allocation or through changes in the robot movements. The envisioned system will detect different arousal states from physiological data such as electrodermal activity (EDA), heart rate (HR), skin temperature (SKT) etc., captured by a sensing device (smartwatch).

3. WHO CAN PARTICIPATE IN THIS RESEARCH STUDY?

Anyone above the age of 18 having adequate English reading and speaking skills and confirming that they are not presently utilizing any medical treatment related to their mental health.

4. WHERE WILL THIS RESEARCH STUDY TAKE PLACE AND HOW MANY PEOPLE WILL PARTICIPATE?

This study will be conducted at NOI Techpark in Bolzano. All data will be acquired at the Human-centered Technologies and Machine Intelligence Lab (HCT lab).

5. WHAT WILL I BE ASKED TO DO AND HOW MUCH TIME WILL IT TAKE?

As potential participant you will follow a link or a QR code included in the advertised material to a webpage where you find information like this participant information sheet, the data privacy policy as well as the pre-screening form. If, after having studied this material, you decide to participate in the study, you can click on "START PRESCREENING". You will be asked to declare your age and knowledge of English via a dropdown menu, to assure that you are above 18 and you have a sufficient level of English for communicating with the research team and to understand the questionnaires. Further, you will also be requested to affirm that you are not currently undergoing any therapy or utilizing any medical treatment pertaining to your mental health. This affirmation will also be facilitated by a dropdown menu. Shouldn't you possess adequate knowledge of English (speaking, reading) or be younger than 18 years, or do not confirm your mental health, you will be excluded from the study. Only

when you fulfil all inclusion criteria, you will be asked for your personal details like name, surname, and contact details to continue so that we can contact you to arrange an experimental appointment. Once you arrive at the lab, before beginning the experiment, the researcher will provide a printed copy of the participant information sheet, and the consent form. You will be given as much time as you need to go through the documents once more and to ask questions. If you agree to continue, you will be asked to sign the consent form and the information sheet. Before starting the experiment, you will be requested to wear a smart watch (Fig. 1) equipped with biosensors to record the physiological signals. Then, you will perform an assembly task in collaboration with a cobot (UR5, Fig. 2). Robot actions, such as dropping the object or failing to pick them and an increased or decreased speed of performing assembly operations, will be used to evoke different levels of arousal during the assembly task and the related physiological signals will be recorded. After every assembly task you will be asked to rate your arousal level through a 2D-canvas displayed on a screen. Between assembly tasks there will be some rest or relaxation time. This procedure will be repeated for different arousal levels, which will be elicited by different robot behaviors.

Please note that you can withdraw from the experiment at any time.



Fig. 1: ADI VSM watch



Fig. 2: Collaborative assembly station with UR5e robot

6. WILL BEING IN THIS RESEARCH STUDY HELP ME IN ANY WAY?

This study aims at developing algorithms that change the robot behavior according to the arousal state of a user in a jointly performed human-robot assembly task. Your participation in this study contributes to the advancement of knowledge in the field of human-robot collaboration in industrial settings.

7. WHAT ARE MY RISKS OF BEING IN THIS RESEARCH STUDY?

Prior to participation, all the volunteers will confirm that they are not presently undergoing any therapy or utilizing any medical treatment related to their mental health. Thus, if you chose from the menu honestly, there is no foreseeable physical and mental health risk for you related to the participation in this experiment.

Regarding personal data, all the captured data will be anonymized, and therefore, there will be no links between your identity and the data published in the final datasets. Furthermore, if you don't want to continue participating you can communicate with the research team and your data will be deleted (please note that this needs to be communicated before data is anonymized).

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

The privacy of your personal data is of utmost importance to us. You will be able to participate in the experiment if you meet our inclusion criteria i.e.: 1- at least 18 years old, 2- have adequate knowledge of English, 3- are not going through any therapy or utilizing medication for mental health. Your data will be anonymized after the session. All links between your identity and the collected data will be destroyed. Please also note that we aim to publish the anonymized data in a public repository. Since the data has been anonymized, there will be no possibility to connect the data in these public datasets to you. The signed consent documents will be stored securely following university rules.

9. WILL I BE GIVEN ANY MONEY OR OTHER COMPENSATION FOR BEING IN THIS RESEARCH STUDY?

You will not receive any monetary compensation for being part of this research study. However, we highly appreciate your enthusiasm and eagerness to advance scientific knowledge. To express our gratitude for your participation, you will be handed out a letter of appreciation from the Human-centered Technologies and Machine Intelligence Lab, University of Bozen-Bolzano, Italy.

10. WHO CAN I TALK TO IF I HAVE QUESTIONS?

You are welcome to ask questions before and after the experiment by contacting the research team members. Zartasha Naeem Khan (e-mail: zkhan@unibz.it) or Prof. Angelika Peer (e-mail: angelika.peer@unibz.it; phone number: +39 0471 017766).

11. WHAT HAPPENS IF I SAY YES, BUT I CHANGE MY MIND LATER?

If during the experiment you decide that you no longer wish to participate in this study, you can contact the research team and your data will be withdrawn. Nonetheless, your data cannot be withdrawn once the data has been anonymized as all direct identifiers from your data will be destroyed.

Thank you for reading this and considering taking part in this study. Do not hesitate to contact the researchers mentioned under point 10 for further information or clarification about this study.