Effect of voice changes in a robot in assisting humans in an emergency situation

Garvit Mathur, University of Bristol

***Abstract*—In an emergency, implementing robots for evacuation purposes in the building has the potential to save lives. The aim of this experiment was to study the effect of robot voice in the scenario of an emergency. To investigate the effect, we conducted an experiment in which a robot was present to lead people to a safe escape during an emergency situation. Based on the robot's voice, the experiment was separated into two scenarios: a robot with a low pitched voice and a robot with a high pitched voice. Nine people were chosen to participate in the experiment. All of the participants took part in both situations, and the order was chosen at random. The time it took to complete the experiment was recorded as a dependent variable, and after each experiment, participants were asked to complete a survey. Surprisingly, all of the participants followed the robot's instructions and took a safe exit instructed by the robot. Participants in the post-experiment questionnaire expressed a preference for following the robot with a low pitched voice over the robot with a high pitched voice. This suggests that a low-pitched, calm and authoritative voice is a better choice for building a robot for an emergency evacuation since it inspires more trust in people.**

I. Introduction

Evacuating people in emergency scenarios has gotten more dangerous as the number of tall buildings has increased [1]. They currently rely on emergency broadcasts, emergency signs, and emergency maps to evacuate, but these can be confusing and result in chaos. People must be evacuated from the building using a safe and dependable evacuation mechanism. Additionally, sending humans to assist people in such situations might be time-consuming and dangerous for them. Robots can be utilised as emergency guides as they become increasingly widespread in people's lives. In an ideal world, robots would assess the situation and make an informed choice about how to safely remove people from the building [2].

In an emergency, the robot's voice could have an impact on instilling trust in evacuees. We centered this study on the tone of the robot voice that could have a greater impact when delivering the emergency message. We created an experiment using two different voices, one with a low pitch and the other with a high pitch. The goal is to see if voice has an effect on people's trust in robots, and if so, which of the two voices is preferred.

II. Related Work

In an emergency, people usually do not have enough reaction time, so the development of an effective evacuation system, such as robot-assisted evacuation, is imperative to ensure human safety and reduce the severity of emergency losses [3]. Robinette and Howard have proposed a robotic design for emergency evacuation in high-rise buildings [4]. They used a standard notification method such as using a fire truck appearance to attract people's attention and gain their trust. However, they did not evaluate people's reactions to such a type of robotic design. To test evacuees' reactions, Nayyar and Wagner employed two strategies, shepherding and handoff. They found that under shepherding conditions, the evacuees are more likely to follow the robot to evacuate [5]. In [6], Wagner proposed a complete evacuation HRI design method, including robot design, experimental design, simulation environment, and ethical factors, which achieved a high evacuation success rate. He argued that the design of robotic instructions and evacuation routes should take into account the possible human responses to emotionally induced stressful scenarios.

Emergency scenarios usually result in unstable and negative human emotions, and the chaotic environment can further reduce people's trust in robots [7]. To make the evacuation robot work, people must trust it so that they will follow its instructions [1] [7] [8], [9].

[10] highlighted the significance of voice in human-robot interaction and proposed the potential impact of voice timbre, frequency and pitch on user trust. They compared high-pitched energetic voices to low-pitched calm voices and found the former to be more engaging in sound and behaviour, and users rated the experience higher. [11] mentioned that in different scenarios, changes in sound could have completely opposite effects. In an investment event, a high pitch would increase trust, whereas, in an interview, a high pitch would decrease trust.

III. Methods

A. Research Question and Hypothesis

As it is discussed in section II, the impact of the robot voice can differ on scenarios. To explore this further, we have postulated the following hypothesis for our user study:

> **Hypothesis:** People will be more likely to trust the robot if instructions for an emergency are given in a lower voice which is perceived to be calmer and more authoritative.

The independent variable applied to the experiment was the tone of the robot voice, with two experiment conditions programmed for the study:

- Calm voice via low pitch and slow pace speech
- Stressed voice via high pitch and quick pace speech

During the experiment, we asked all participants to answer 3 separate questionnaires; before the experiment to measure trust level for the robot prior to experiment, after each experiment to measure user experience based on the robot voice, and lastly a final questionnaire which measured the overall user experience of the experiment and their opinion on the different tones of instruction of instruction. Question topics included perceived levels of trustworthiness, anthropomorphism, likability and robots intelligence.

B. User Study Design

Acclimatisation interaction: Before the main user study run, the participants were asked to interact with a NAO robot with a neutral pitched voice in order to get used to interacting with a NAO robot. In this session, the NAO robot greets with a waving hand gesture and asks several predefined questions.

Main study interaction: In the main session, a test environment was set up with taped walkways on the floor, taped 'instruction zone', 2 destinations to the left and right of the NAO robot as illustrated in Fig 1.

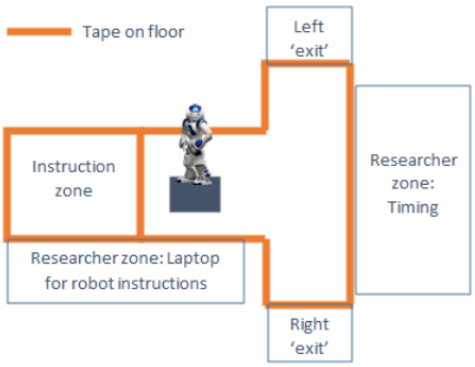


Fig. 1: User study environment.

The NAO robot provides instructions on which is the safe exit with a pointing gesture repeatedly. And participants were asked head to a safe exit either on the left or right of the corridor. The direction options were only Left and Right, and these were randomised for each participant to reduce order effects on the internal validity of the experiment.

The main user study is conducted twice in a row on different voice pitches and the directions of the safe exit varies randomly. The order of the voice pitch is also random because it can be an internal validity of this user study. The instructions were provided repeatedly.

The result of the user study was measured using both subjective and objective methods. The subjective measurement is questionnaires indicated in section III-A. And the objective measurements are if the participants chose the correct end location and time to get to the location.

The programs used in the introduction and main session are shown in Fig 3a and 3b.

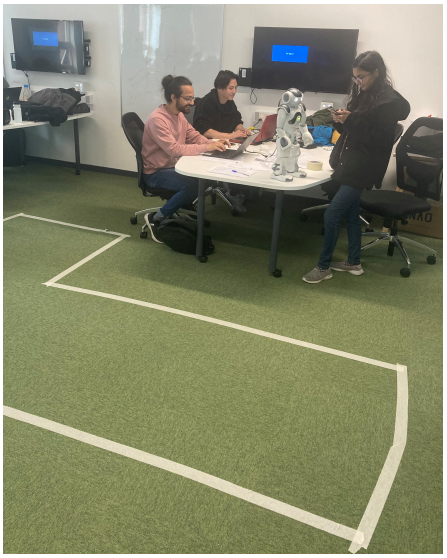


Fig. 2: Participant completing questionnaire on a phone after an iteration of the main study interaction.

C. User Study Procedure

On arrival to the study, participants were directed to a space outside of the user study environment to complete a briefing, a paper consent form, and an initial online pre-experiment questionnaire (as described in section III-D), accessed via QR code. The use of a separate space was to reduce the interaction of participants prior to the study to hearing the pitches and tones of voice the robot used in the main study.

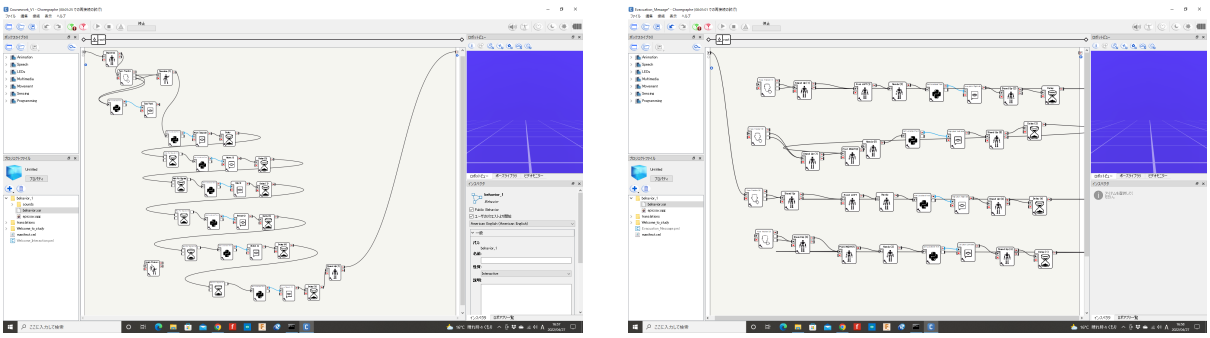
Once the online questionnaire and consent form were checked by a member of the research team, the participant was directed to the User Study space to complete the acclimatisation interaction described in section III-B.

At this point, another member of the research team completed a verbal briefing for the running of the experiment, describing the scenario as an emergency situation, and directing the participants to take their nearest exit in a safe and calm manner.

The first iteration of the main study interaction was run as described in section III-B. Additional members of the research team were tasked with i. running the desired program from Choreographe and timing the experiment run, and, ii. noting the independent variables selected - high or low pitch, left or right, and if the participant took the correct exit described.

Following the first iteration of the main study, participants were asked to complete the online questionnaire as described in section III-D (see Fig. 2). The main experiment and the online questionnaire responses was repeated.

Participants were then instructed to leave the testing area and complete a final questionnaire which summarised their overall impression of the robot and experience during the study (see section III-D).



(a) Program of the introduction conversation.

(b) Program of the main session.

Fig. 3: Programs created in Choregraphe for the NAO Robot

A member of the research team checked all sections of the questionnaire had been completed and then a post experiment debrief was given. The debrief provided further information on the aims of the study, outlined what data had been noted for each participant and reminded them that they had 7 days to request for their data to be removed. All participants were thanked for their support during the user study.

D. Dependent Measures

Subjective measurements were taken as part of the user study via participant questionnaire, a copy of which is included in Appendix A, and time and correct exit were taken as objective measurements.

E. Participants

In all, 9 participants completed all aspects of the user study. Participants were recruited from the Engineering building at the UWE campus in Bristol, and, as a result, the demographic of those who participated was small.

A summary of the participant demographic is as follows;

- **Participant Age** - average age of participants was 25, with a range of ages from 23 to 27 years old
- **Participant Gender** - the split of male:female in participants was 6:3
- **Robot Interaction** - 89% of participants had interacted with a robot before. Of those who had interacted with a robot before, they rated their experience on average as 6.6 on a scale of 0, extremely bad, to 10, extremely good.

IV. Results

The null hypothesis proposed in this experiment was that the robot voice does not influence its capability of conveying the message to the human during an interaction. To analyse this, we choose the time of experiment as a metric for both scenarios. Statistically, the low pitch voice sample (mean = 16.75) and high pitch voice sample (mean - 18.01) have shown a p-value of 0.23 on a paired sample t-test. The Cohen's D value of 0.19 for the sample group also suggests that the sample has a very small size group and the majority of the sample points are overlapping in the dataset. The p-value greater than 0.05 and Cohen's D value less than 0.2 imply insufficient evidence to reject the null hypothesis. On the other hand, Fig. 4 shows the box-whisker plot of the experiment time of participants for low pitch voice and high pitch voice scenarios. From observation, it is visible that the average time taken by participants was less in low pitch voice cases than compared a high pitch. Additionally, Fig. 5 shows the box-whisker plot of participants ranking the interaction with a robot in two different scenarios, i.e. robot with a low voice and robot with a high voice. The plot shows that low pitch voice has a high mean ranking (7.5) compared to high pitch voice mean (5.7).

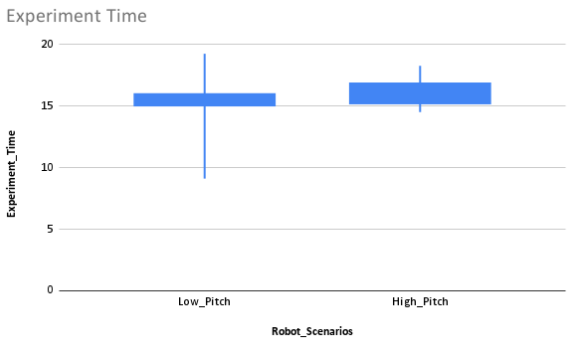


Fig. 4: Box-Whisker Plot of Experiment time in both scenarios

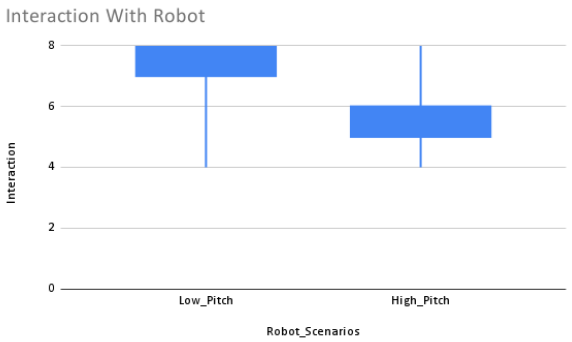


Fig. 5: Box-Whisker Plot of Participants Rating Robot Interaction in both scenarios

Result from the survey questions shows that, when asked which of the two robots (tone of voice) they would prefer in an emergency, eight out of nine participants said they preferred the robot with the low pitch voice, while just one said they preferred the high-pitched voice. The reason that was given by most people (5 out of 9) for this was that the tone and voice of the robot was authoritative, while 3 out of the 8 people reasoned that the robot was clearer. This suggests that 88.88 percent of individuals prefer the robot to offer instructions in a lower pitched voice in an emergency. The remaining 1 person who chose the low-pitched robot as the preferred choice said that they did not in fact have a preference and that they did not notice any difference in the tone of the two robots, meaning that most people find a robot with a low-pitched voice sounds more authoritative and hence trust these to give instructions in an emergency, therefore, proving our hypothesis.

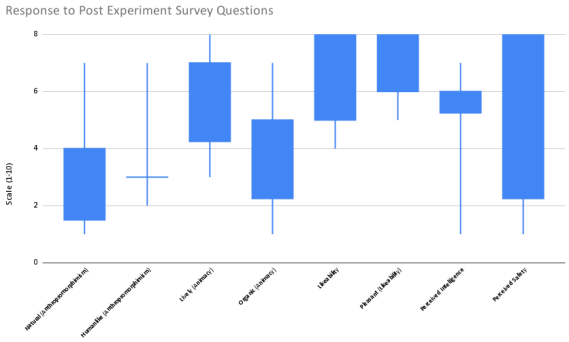


Fig. 6: Survey Questionnaire Result

This pattern can also be visualized from the post-experiment questionnaire analysis. Fig. 6 shows that the majority of participants considered the interaction with the robot to be less natural and human-like, they had a mixed reaction about the likeliness towards the robot; some were amused by seeing a robot in such a situation and some felt that it was rather dangerous. Participants also felt that the behaviour of the robot in the condition was less organic. They considered the robot to have an average perceived intelligence, and had mixed feelings about the safety of using such a robot in an emergency like this. But the majority of participants liked the involvement of robots in emergencies and showed pleasant interaction with the robot.

When asked whether they preferred humans or robots to issue emergency evacuation instructions, the response was predictable, with people preferring humans. What was more interesting was that in this situation, individuals were nearly neutral toward both humans and robots, indicating that they were not totally opposed to trusting them. When asked about suggestions on how to make the robot more engaging and trustworthy, the majority of participants proposed more synchronized and regulated arm movements, as well as frequent repetition of the instructions.

V. Discussion

The p-value of 0.23 calculated using the participants' sample set's experimental time is greater than our confidence interval value (0.05), indicating that our null hypothesis of no significant impact of robot voice on the participant is correct. The relevance of p-values, however, is challenged by Cohen's D value of 0.19, which suggests that the sample set of studies has a little difference. The results of the post-experiment questionnaire, on the other hand, reveal that people prefer low-pitched robots to high-pitched robots. This validates our theory that in an emergency, a robot with a calm and authoritative low-pitch voice is more trustworthy.

A small amount of research has been done into the effect of the robot's voice on human trust development. The study conducted by [12] supports our hypothesis about the impact of voice on human-robot contact; it implies that standard accents and high pitched voices generally create higher trust, but this varies depending on the circumstance. In a conceptualised research of robots in emergency scenarios, [6] recommended that robots should be authoritative and commanding to acquire people's trust during evacuation.

Our study proposes a better voice tone for robots created for emergency scenarios. This might be used to create a robot that helps people trust each other during an evacuation.

The experiment for this study was conducted on a very small group of people, and eight out of nine of them had prior experience with a robot, which influenced the outcomes. The experiment was straightforward and did not include any complexity that would impair the feasibility of the outcome. The study's goal is to create a robot for emergency situations that involve emotion and influences their decision-making abilities. However, the proposed experiment was conducted in a safe classroom atmosphere and so excludes the emotional aspect.

VI. Conclusion

This research reveals that the robot's voice is an important design component to consider when creating an evacuation guide robot. People will be more trusting of a robot with a calm and authoritative low pitched voice, and it will be more efficient in evacuating people during an emergency. This research helps in the development of a more reliable robot for the safe evacuation of people during an emergency. This research is important for researchers working on an intelligent system for evacuation, and it aids in the selection of a better robot voice. To improve the outcomes, further work for this study will include increasing the number of participants. Because the population picked here has already interacted with a robot, a more diverse group would provide a better knowledge of human-robot interaction. In addition, the study could include more voice qualities in order to produce a more exact speech structure for evacuation robots.

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APPENDIX A
PARTICIPANT QUESTIONNAIRES

Accessed via a QR code, a google form had the following questions inputted.

A. Pre-experiment Subject Questionnaire

on trust level for robot prior to experiment. Specifically asking;

- Have you interacted with a robot before? (0:No, 10:Yes)
- (If Yes) How will you rate your experience? (0:extremely bad, 10:extremely good)
- How comfortable are you having robots in your buildings or work place? (0:very uncomfortable, 10:very comfortable)
- How well do you think you can trust a robot to guide you in an emergency situation?(0:not at all trustworthy, 10:extremely faithful)

B. Post each main experiment iteration

which was used to assess the user experience based on the robot voice. Specifically asking;

- How did you feel about your interaction with the robot? (0:extremely bad, 10:extremely good)
- "How clear and understandable were the instructions given by the robot?(0:not at all clear, 10:extremely clear)"
- "How trustworthy was the information conveyed by the robot was?(0: not at all likely,10:extremely likely)"

C. Final Questionnaire

which was split into two parts, firstly assessing the overall expression of the robot and then experience of the experiments. Specifically asking:

- Final questionnaire - Overall expression of robot
  - Anthropomorphism (0:fake, 10:natural)
  - Anthropomorphism (0:machinelike, 10:humanlike)
  - Animacy (0:stagnant, 10:lively)
  - Animacy (0:mechanical, 10:organic)
  - Likeability (0:dislike, 10:like)
  - Likeability (0:unpleasant, 10:pleasant)
  - Perceived intelligence (0:incompetent, 10:competent)
  - Perceived safety (0:anxious, 10:calm)
- Final questionnaire - Overall experience after experiments
  - How was your overall interaction with both the robots? (0:extremely bad, 10:extremely good)
  - Which of the two robots would you prefer best in an emergency situation? (0:scenario 1 robot, 10:scenario 2 robot)
  - Who would you prefer more to give out emergency evacuation instructions, a human or a robot? (0:human, 10:robot)
  - Please rate your overall experience of the experiment. (0:horrible, 10:great)

APPENDIX B
USER CONSENT

A. *Consent form*

Two copies of the following form were provided to participants in printed format. One for the participant to keep and one to hand to the research team.

Consent Form

Study Title: *Use of robots to provide safety information in an emergency*

This consent form will have been given to you with the Participant Information Sheet. Please ensure that you have read and understood the information contained in the Participant Information Sheet and asked any questions before you sign this form. If you have any questions please contact a member of the research team, whose details are set out on the Participant Information Sheet.

If you are happy to take part in this study please sign and date the form. You will be given a copy to keep for your records.

Please read the statements below and sign below to give consent:

I have read and understood the information sheet
I have been given the opportunity to ask questions and have had my questions answered to my satisfaction.
I am aware of the risks and benefits of taking part in the study
I am aware that data collected will be anonymised, kept in accordance with General Data Protection Regulation (GDPR), and will be viewed and analysed by the research team as part of their studies.
I am aware that I have the right to withdraw consent and discontinue participation without penalty before or during the study.
I am aware that I have the right to withdraw my data from the experiment up to 7 days after the completion of the experiment, using the participant ID that the researcher will provide.
I have freely volunteered and am willing to participate in this study.
I am willing to have my questionnaire responses collected.

Name (Printed).....

Signature..... Date.....

B. Study Information form for participants

Each participant in the study was provided one printed copy of this information form.

Study Information Sheet

Study Title: *Use of robots to provide safety information in an emergency*

PLEASE READ THIS SHEET IN ITS ENTIRETY

You are invited to take part in research taking place at the University of the West of England, Bristol. It is carried out as assignment for module UFMFHP-15-M Human-Robot Interaction. Before you decide whether to take part, it is important for you to understand why the study is being done and what it will involve. Please read the following information carefully and if you have any queries or would like more information please contact *Garvit Mathur, Helen McGloin, Yusuke Miyawaki, Srilatha Mysore Nagendra, and Wei Ning*, Faculty of Environment and Technology, Bristol Robotics Laboratory, University of the West of England, Bristol, *go21715@bristol.ac.uk*, *h.mcgloin@bristol.ac.uk*, *ei21862@bristol.ac.uk*, *az21815@bristol.ac.uk*, *ve21384@bristol.ac.uk*.

Who is organising the research?

The project is led by *Garvit Mathur, Helen McGloin, Yusuke Miyawaki, Srilatha Mysore Nagendra, and Wei Ning*, University of the West of England. Manuel Giuliani is the supervisor for this research. Please find their details at the end of this document.

What is the aim of the research?

The overall aim of the research is *to investigate people's trust in robot instructions under emergency evacuation situations.*

The purpose of this study is to *understand a participants' reactions to robot in an emergency situation. The study will focus on perceived trust and intelligence by the human participant of the robot in the scenario given, and the success of the participant in evacuating from the simulated emergency.*

Why have I been invited to take part?

We are recruiting participants who are already working at the University of the West of England and are aware of the current risk and safety procedures due to COVID-19 restrictions.

Do I have to take part?

You do not have to take part in this research. It is up to you to decide whether or not you want to be involved. If you do decide to take part, you will be given a copy of this information sheet to keep and will be asked to sign a consent form. If you do decide to take part, you are free to stop and withdraw from the study at any time without giving a reason.

What will happen to me if I take part and what do I have to do?

You will first be asked to sign a consent form, read a privacy notice, and provide some basic demographic *information via a questionairre online. This can be done on your phone and you will be given a QR code to access the form. On completion of the pre-experiment questionairre you will be asked to proceed to the experiment area where you will interact with a robot in a general conversation.*

You will move into the experiments which you will run through twice. The experiments simulate an emergency situation where you need to exit a building. There are two possible exits from this building – the left and right, marked with tape on the floor. The robot has also been placed into this scenario, programmed to support in an emergency. We ask that you proceed safely and calmly to your nearest exit. The experiment is all run at a single level to ensure it is accessible.

Following each experiment you will be asked to compelte a short questionairre using your phone. Finally you will be asked to compelte a post experiment questionairre on your phone.

The study will take approximately *20* minutes.

Data will be gathered using the following methods:

Questionnaires

Before starting the experiment, you will need to complete a pre-experiment questionnaire. After each experiment, a questionnaire will be carried out. Finally, you will need to fill out an end-of-experiment questionnaire to help us understand how your attitudes changed before and after the experiment. Therefore, you will need to fill out a total of four questionnaires, each of which is very brief and can be completed in a few minutes.

Task Performance

The following items will be collected as task performance metrics.

1) *The time taken to reach your chosen exit*
2) *Whether the correct safe exit was selected*

What are the possible risks of taking part?

The potential risks of this experiment exist in the following aspects:

1) *This is a simulated emergency scenario, where you may have negative emotions such as anxiety, nervousness about robot instructions and you own safety.*

What will happen to your information?

All the information we receive from you will be treated in the strictest confidence.
All the information that you give will be kept confidential and anonymised. You will be assigned a participant ID that you can use to request the removal of your data from the

study up to 7 days after completion of the experiment. After this point, the anonymised data will be analysed, and we will ensure that there is no possibility of identification or re-identification from this point.

Hard copy material (the consent form) will be kept in a locked and secure setting to which only the researchers will have access in accordance with the University's and the Data Protection Act 2018 and General Data Protection Regulation (GDPR) requirements.

Where will the results of the research study be published?

The results of this usability study will be reported in the coursework report for UWE module UFMFHP-15-M Human-Robot Interaction.

Who has ethically approved this research?

The project has been reviewed and approved by University of the West of England University Research Ethics Committee. Any comments, questions or complaints about the ethical conduct of this study can be addressed to the Research Ethics Committee at the University of the West of England at: Researchethics@uwe.ac.uk

What if something goes wrong?

If you have any questions about the ethical conduct of this research, have any complaints or concerns, or are uncertain about any aspect of your participation please contact the project supervisors or the University's research ethics committee.

Project Supervisor:
Professor Manuel Giuliani manuel.giuliani@uwe.ac.uk

What if I have more questions or do not understand something?

If you would like any further information about the research please contact in the first instance:

Garvit Mathur	*go21715@bristol.ac.uk*
Helen McGloin	*h.mcgloin@bristol.ac.uk*
Yusuke Miyawaki	*ei21862@bristol.ac.uk*
Srilatha Mysore Nagendra	*az21815@bristol.ac.uk*
Wei Ning	*ve21384@bristol.ac.uk*

Thank you for agreeing to take part in this study.

You will be given a copy of this Participant Information Sheet and your signed Consent Form to keep.

APPENDIX C
ETHICAL APPROVAL

The following form was submitted for ethical approval for the study.

UWE Bristol | University of the West of England

Faculty of Environment & Technology
Faculty Research Ethics Committee (FREC)

Ethical Review Checklist for Undergraduate and Postgraduate Modules

Staff and PG research students must not use this form, but should instead, if appropriate, submit a full application for ethical approval to the Faculty Research Ethics Committee (FREC).

Please provide project details and complete the checklist below.

Project Details:

Module name	**Human-Robot Interaction**
Module code	**UFMFHP-15-M**
Module leader	Manuel Giuliani
Project Supervisor	**Dr. Paul Bremner**
Proposed project title	**Emergency Evacuation Robot**

Applicant Details:

Name of Student	Garvit Mathur, Srilatha Mysore Nagendra, Helen McGloin, Yusuke Miyawaki, Wei Ning
Student Number	21070316, 21070380, 21065479, 21070325, 21070333
Student's email address	go21715@bristol.ac.uk, az21815@bristol.ac.uk, h.mcgloin@bristol.ac.uk, ei21862@bristol.ac.uk, ve21384@bristol.ac.uk

	CHECKLIST QUESTIONS	Yes/No	Explanation
1.	Does the proposed project involve **human tissue, human participants, animals, environmental damage, or the NHS.**	Yes	Since our project is based on understating how people find the instructions given by the robot for an emergency evacuation helpful and prefer it or not, we need to test on human participants
2.	Will participants be clearly asked to give consent to take part in the research and informed about how data collected in the research will be used?	Yes	We will be asking the participants their consent before starting the experiment and giving information about how their data(Name, Age, Gender and if they have any diability) is being used in the research
3.	If they choose, can a participant withdraw at any time (prior to a point of "no return" in the use of their data)? Are they told this?	No Yes	A participant can withdraw at any point during the experiment. Participants then have 7 days to request withdrawal of data after the

	CHECKLIST QUESTIONS	Yes/No	Explanation
			experiment They are informed about this in the study information sheet
4.	Are measures in place to provide confidentiality for participants and ensure secure management and disposal of data collected from them?	Yes	All the information will be kept confidential and anonymised. The participants are allotted an ID and can use to request the removal of their data from the study up to 7 days after completion of the experiment. After this point, the anonymised data will be analysed and ensured that there is no possibility of identification or re-identification from this point
5.	Does the study involve people who are particularly vulnerable or unable to give informed consent (eg, children or people with learning difficulties)?	No	The study involves people of different age groups
6.	Could your research cause stress, physical or psychological harm to humans or animals, or environmental damage?	No	Because all participants are aware that this is not a true emergency and that they are in no danger, there should be no psychological stress, or if there is, it should be minimal.
7.	Could any aspects of the research lead to unethical behaviour by participants or researchers (eg, invasion of privacy, deceit, coercion, fraud, abuse)?	No	No aspects of the research would lead to unethical behaviour by participants or researchers
8.	Does the research involve the NHS or collection or storage of human tissue (includes anything containing human cells, such as saliva and urine)?	No	The research does not involve the NHS or collection or storage of human tissue.

Your explanations should indicate briefly for Qs 2-4 how these requirements will be met, and for Qs 5-8 what the pertinent concerns are.

- **Minimal Risk:** If **Q 1 is answered 'No'**, then no ethics approval is needed.
- **Low Risk:** If **Qs 2-4 are answered 'Yes' and Qs 5-8 are answered 'No'**, then no approval is needed from the *Faculty Research Ethics Committee* (FREC). However, your supervisor must approve (a) your information and consent forms (Qs 2 & 3) and (b) your measures for participant confidentiality and secure data management (Q4).
- **High Risk:** If **any of Qs 5-8 are answered 'Yes'**, then you must submit an application for full ethics approval *before* the project can start. This can take up to 6 weeks. Consult your supervisor about how to apply for full ethics approval.

Risk Assessment: Separate guidance on risk assessment can be found on UWE's Health and Safety forms webpage at https://go.uwe.ac.uk/RiskAssessment. If needed, you must complete a Risk Assessment form. This must also be attached to your application for full ethics approval if your project is **High Risk**.

Your supervisor must check your responses above before you submit this form.
Submit this completed form via the *Assignments* area in Blackboard (or elsewhere if so directed by the module leader or your supervisor).
After you have uploaded this form, your supervisor will confirm it has been correctly completed by "marking" it as *Passed*/100% via the *My Grades* link on the Blackboard.

Further research ethics guidance is available at http://www1.uwe.ac.uk/research/researchethics

APPENDIX D
SCRIPTS

The following script was used by the research team for the briefing, during experiment and debriefing.

Briefing script (Srilatha):

Thank you for joining our experiment. Your time supporting this experiment will be split into the following phases:

- Firstly you will complete a consent form and pre-experiment questionnaire
- Secondly you will go into the experiment area where you will interact with a robot. Initially you will have a general conversation with the robot and then you will move into the experiments.
- There will be two runs of the experiment, in each experiment you will consider yourself in an emergency where you need to exit a building. There will be a team member running and explaining the experiment to you so you will receive further instruction then.
- After each experiment run you will be directed to complete a very short questionnaire
- Lastly, you will return to this space to complete a post-experiment questionnaire.

Overall, this should take 15 mins of your time.

All the questionnaires will be completed on your phone, while the consent is in paper format. Please read and sign the consent now. Please scan this QR code to get the questionnaire and only complete section 1 on the questionnaire on your phone. Let me know when you have completed both these things. Also if you have any questions, please let me know.

Running the experiment brief (Helen)

Thank you for completing the pre-experiment questionnaires and consent forms. We would be grateful if you could complete an initial conversation with our robot before we proceed during the experiments.

Yusuke to run acclimatization conversation

Ok, now we are going to run the experiments. You will go through the experiment twice. In both experiments you will be simulating an emergency situation where you need to exit a building. There are two possible exits from this building – the left and right, marked with tape on the floor. The robot has also been placed into this scenario, programmed to support in an emergency. We ask that you proceed safely and calmly to your nearest exit.

This emergency scenario simulation will be run twice. After each run you will need to complete a short questionnaire based on your reactions.

Ok, we will begin

Yusuke to run iteration 1 of emergency programming

Thank you. Please complete section 2 of the questionnaire only

Yusuke to run iteration 2 of emergency programming

Thank you. Please complete section 3 of the questionnaire only.

Now that you have completed sections 2 and 3 of the questionnaire, there is a longer section 4 post experiment questionnaire that needs completing. Please head back to see Srilatha while you complete this section.

Post experiment de-brief (Srilatha)

check that they have completed section 4 of the questionnaire and submitted it

Thank you for being part of our study today. I hope you enjoyed it. The aim of our study is to see if people trust a robot to provide instructions in emergency. Specifically, we want to understand if the tone and pitch of the robots voice effects how trustworthy and intelligent the human participants believe the robot is. We have hypothesized that a person is more likely to follow a robots instruction in an emergency situation if the robot has a lower voice as it will be perceived as more authoritative.

In addition to your questionnaire responses we made a note of the robot voice type which could be high or low pitched, and which direction you should take. We have recorded if you took the correct exit and also how long it took you to get from the start location to the exit you selected.

You have 7 days to let us know if you would like your data removed from the experiment. Otherwise, we hope you enjoyed the experience and hope you have a good day.