

Request for genIC Approval
CDC/ATSDR Direct Reading Methodologies, Sensors, and Robotics Technology
Assessment in Lab/Simulator-based Settings
0920-1441

CIO: The Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR)

PROJECT TITLE: Evaluation of robot to human communication designs

PURPOSE AND USE OF COLLECTION:

The Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) seeks approval from the Office of Management and Budget (OMB) to conduct research around the effectiveness of a sub-set of automated direct reading methodologies, sensor technologies, and robotics technologies that are used to protect worker safety and health.

For this information collection request, we will collect data for a project titled “*Evaluation of Robot-to-Human Communication Designs*” in NIOSH’s Robotics Lab in Morgantown, West Virginia. The study aims to investigate the effectiveness of robot-to-human safety communication designs. Specifically, this research will examine the impact of different simulated robot interface modalities, message types, and safety-relevancies on users’ perceived robot-to-human communication effectiveness.

This study is a single-session in-laboratory study. Participants will be asked to perform a handover task with a collaborative robot in a virtual reality (VR) environment. The participant will retrieve multiple objects from the robot and arrange them on a tray, while detecting and responding to robot errors. Participants will be presented with “conditions” that encompass varying combinations of interface modalities, message types, and safety-relevancies. Specifically, the study includes five types of interface modalities (i.e., visual-lights, visual-graphical, visual-verbal, auditory-tone, and auditory-speech), two message types (i.e., status-based and intention-based), and two safety-relevancies (i.e., high and low risk levels). Thus, a total of 20 conditions (5 interface modalities X 2 message types X 2 safety-relevancies) will be tested in the study. Participants will be recruited (Attachment A) and, before taking part in the study, will be screened for simulator sickness susceptibility. If participants experience car sickness or simulator sickness from playing video games, they are not eligible to participate. Participants will sign an informed consent form at the start of the experiment session (Attachment B).

The data we will collect from the participants include demographic information (Attachment C), experience working with robots and attitude towards robots (Attachment D), experience using VR (Attachment E), level of VR sickness (Attachment F), a post-condition questionnaire that will evaluate perceived difficulty working with the robot, perceived safety, trust in the robot, and perceived workload (Attachment G), and an evaluation of the robot’s behavior and performance (Attachment H). Additionally, the VR device will record the participant’s accuracy and reaction time while responding to the robot errors and the overall task completion time. All the instruments being used are included as example instruments in the parent genIC package 0920-1441.

All paper forms and digital data will be coded with a unique ID number for each participant. The enrollment log will be kept in a locked cabinet and will be available only to the named investigators. The raw data with the unique ID number will be entered and stored on a server computer. Data on the server is backed-up daily. Two levels of physical security are always maintained for the data libraries—controlled office access, and ID/password access to data storage devices. The findings of this research will have implications in the development of effective communication designs of collaborative robots.

DESCRIPTION OF RESPONDENTS

The respondent universe will be recruited from the general population, but demographic characteristics are expected to be reflective of the full spectrum of the U.S. workforce. Respondents will be recruited via a variety of avenues (e.g., email, flyers) and are expected to vary in gender, age, race, and ethnicity.

For this information collection, the target sample size is 53 participants. We will recruit up to 61 participants to account for potential dropouts. Participants will be 18 years of age or older and have experience working in the manufacturing industry, warehousing industry, or in a stockroom. The demographic composition of the participants will reflect the demographic composition of the manufacturing industry across the United States as closely as possible. Currently, workers who are female represent 30% of the manufacturing worker population. Workers who are Black, Asian, and Hispanic/Latino people represent 11%, 8%, and 18%, respectively.

CERTIFICATION:

I certify the following to be true:

1. The collection is voluntary.
2. The collection is low-burden for respondents and low-cost for the Federal Government.
3. The collection is non-controversial and does not raise issues of concern to other federal agencies.
4. Information gathered will not be used to substantially inform influential policy decisions.
5. The study is not intended to produce results that can be generalized beyond its scope.

Name: Justin Haney

To assist review, please answer the following questions:

Personally Identifiable Information:

1. Is personally identifiable information (PII) collected? [☐] Yes [☒] No
2. If Yes, is the information that will be collected included in records that are subject to the Privacy Act of 1974? [☐] Yes [☒] No
3. If Applicable, has a System or Records Notice been published? [☐] Yes [☒] No

Gifts or Payments:

Is an incentive (e.g., money or reimbursement of expenses, token of appreciation) provided to participants? [☒] Yes [☐] No

Payment will be completed through the U.S. Debit Card Program (USDCP), which was established by the U.S. Treasury Department along with Flagstar Bank and Fiserv to enable federal agencies to deliver payments through debit cards and other digital disbursements as a more secure, efficient, and streamlined method of reimbursement. In this study, participants will be compensated for their participation at a rate of \$30/hour that will be loaded onto a debit card upon study completion. Partial hour payments will also be issued at the rate of \$10 per 20 minutes, and shorter periods will be rounded up to a full 20-minute period. Participants recruited for the study will make one visit to the laboratory, which is estimated to take approximately 4 hours. A Record of Test Subject Participation Form (Attachment I) will be kept in a locked file cabinet to track reimbursement by recording the amount paid to each participant in a data log. Participant identity will be kept confidential using a subject ID code and will also not be linked to the individual data provided during participation.

BURDEN HOURS

This project includes 1 study that, at a maximum, will recruit and burden 61 individuals. A summary of the data collection activities, the number of responses per respondent, and the average response time per respondent is provided in Table 1 for these data collection activities.

Table 1. Burden hours

Category of Respondent	Form Name	Number of Respondents	Number of Responses per Respondent	Average Hours Per Response	Total Response Burden (Hours, rounded up/down)
	Participant Recruitment Questionnaire	61	1	10/60	10
	Informed Consent Form	61	1	5/60	5
	Pre-study Questionnaire: Demographics Survey	61	1	1/60	1
	Pre-study Questionnaire: Robot Experience Questionnaire	61	1	2/60	2
	Pre-study Questionnaire: Virtual Reality Experience Questionnaire	61	1	1/60	1
	Virtual Reality Sickness Questionnaire	61	2	1/60	2
	Installation / set up of virtual reality controller with participants in order to collect performance	61	2	10/60	20

	measures during study				
	Post Condition Questionnaire: Perceived Difficulty of Interface Modality, safety, and trust	61	20	2/60	41
	Robot Evaluation Questionnaire	61	20	1/60	20
Total					102

FEDERAL COST: The estimated annual cost to the Federal government is **\$31,334.48**

The cost for compensating participants who take part in the data collection process for this project is \$7,320. In addition to this compensation cost, the cost of two researchers conducting and overseeing the study (one GS12-5, and one GS13-2) for a total of 244 hours each is \$24,014.48, as shown in Table 2. Therefore, the total estimated cost to the Federal Government is \$31,334.48.

Table 2. Estimated cost for two researchers GS12 and GS13 to conduct and oversee data collection.

	Number of Participants	Duration of Experiment	Hourly Rate	Total cost
GS12-5	61	4	\$47.22	\$11,521.68
GS13-2	61	4	\$51.20	\$12,492.80
Total	122			\$24,014.48

If you are conducting a focus group, survey, or plan to employ statistical methods, please provide answers to the following questions:

The selection of your targeted respondents

1. Do you have a customer list or something similar that defines the universe of potential respondents and do you have a sampling plan for selecting from this universe? ☐ Yes ☒ No

If the answer is yes, please provide a description of both below (or attach the sampling plan)? If the answer is no, please provide a description of how you plan to identify your potential group of respondents and how you will select them?

For this project, potential respondents will be identified through targeted recruitment efforts, or a convenience selection of key informants selected from the relevant study population. Screening questions will be used to determine eligibility. See Attachment A for the recruitment flyer and screening script to be used during recruitment.

Refer to attached sampling plan for this information, which also highlights the consent process (Attachment B) to inform potential participants of the private and voluntary nature of the study and provide general information about the study, the topics to be covered in the study, potential risks, and the token of appreciation available for completing the study.

Administration of the Instrument

1. How will you collect the information? (Check all that apply)

☐ Web-based or other forms of Social Media

☒ Telephone

☒ In-person

☐ Mail

☐ Other, Explain

2. Will interviewers or facilitators be used? ☒ Yes ☐ No

Please make sure all instruments, instructions, and scripts are submitted with the request.