



DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention

[30Day-21-20PR]

Agency Forms Undergoing Paperwork Reduction Act Review

In accordance with the Paperwork Reduction Act of 1995, the Centers for Disease Control and Prevention (CDC) has submitted the information collection request titled Improving Safety of Human-Robot Interaction to the Office of Management and Budget (OMB) for review and approval. CDC previously published a "Proposed Data Collection Submitted for Public Comment and Recommendations" notice on August 26, 2020 to obtain comments from the public and affected agencies. CDC did not receive comments related to the previous notice. This notice serves to allow an additional 30 days for public and affected agency comments.

CDC will accept all comments for this proposed information collection project. The Office of Management and Budget is particularly interested in comments that:

- (a) Evaluate whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility;
- (b) Evaluate the accuracy of the agencies estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;

(c) Enhance the quality, utility, and clarity of the information to be collected;

(d) Minimize the burden of the collection of information on those who are to respond, including, through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g., permitting electronic submission of responses; and

(e) Assess information collection costs.

To request additional information on the proposed project or to obtain a copy of the information collection plan and instruments, call (404) 639-7570. Comments and recommendations for the proposed information collection should be sent within 30 days of publication of this notice to www.reginfo.gov/public/do/PRAMain. Find this particular information collection by selecting "Currently under 30-day Review - Open for Public Comments" or by using the search function. Direct written comments and/or suggestions regarding the items contained in this notice to the Attention: CDC Desk Officer, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503 or by fax to (202) 395-5806. Provide written comments within 30 days of notice publication.

Proposed Project

Improving Safety of Human-Robot Interaction - New - National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC).

Background and Brief Description

The mission of the National Institute for Occupational Safety and Health (NIOSH) is to promote safety and health at work for all people through research and prevention. NIOSH has initiated a study among manufacturing workers to improve safety of workers that work in close proximity with robots. Study results will be used to improve safety standards and lead to better design guidelines for industrial robots.

Rapid growth of advanced collaborative and mobile robots warrants investigation on safe human-robot interaction for their potential injurious energy transmission from a robot to a worker. Traditional safety measures for industrial robots, such as protective barriers, are no longer valid for the emerging collaborative and mobile robots. Physical contacts between human workers and robots are inevitable and even desired when they share a common workspace or work directly with each other under collaborative operations. Therefore, NIOSH is proposing a study to evaluate the effects of different characteristics of robots on human behaviors, perceived safety, workload, and trust.

The study will take advantage of virtual reality technology to simulate human-robot interaction during data collection sessions. Participants will conduct two related experiments that will involve performing simulated warehouse tasks (e.g. loading/unloading boxes from shelves) in a virtual reality laboratory. Participants will interact with a mobile robot in the first experiment and a collaborative robot arm in the

second. They will wear glasses that will allow them to see virtual 3D images of the robots and other objects in the environment. During each experiment task, we will use motion capture technology to track the movement and location of the participants and the virtual robots. This will allow us to track movement speed and separation distance from the virtual robots. After each experiment task, we will administer three questionnaires to the participants that will ask them about their perceived safety, mental workload, and trust in the robots. We will analyze how these measures change based on the virtual robot's operating speed, size, and movement trajectory.

Data collections will occur at the NIOSH facility in Morgantown, West Virginia. The target study population will be workers who currently work or had worked in the manufacturing industry, with varying job experiences. The burden table below accounts for 111 respondents over a three-year data collection period. Respondents will complete all forms only once, besides the Virtual Reality Sickness Questionnaire, which will be administered at the beginning and end of the data collection, and the three questionnaires (NASA Task Load Index, Perceived Safety Questionnaire, and Robot Trust Questionnaire), which will be administered after each of the 63 combined experiment trials for Experiments 1 and 2. The total estimated burden hours is 216.

Estimated Annualized Burden Hours

Type of Respondents	Form Name	Number of Respondents	Number of Responses per Respondent	Average Burden per Response (in hours)
Manufacturing Workers	Simulator Sickness Susceptibility Questionnaire	37	1	1/60
	Consent Form	37	1	10/60
	Participant Data Collection Form	37	1	1/60
	Virtual Reality Sickness Questionnaire	37	2	1/60
	Robot Experience Questionnaire	37	1	6/60
	Actual Experiment 1 - Mobile Robot	37	1	70/60
	Actual Experiment 2 - Collaborative Robot	37	1	70/60
	NASA Task Load Index	37	63	1/60
	Perceived Safety Questionnaire	37	63	1/60
	Robot Trust Questionnaire	37	63	1/60

Jeffrey M. Zirger,

Lead,

Information Collection Review Office,

Office of Scientific Integrity,

Office of Science,

Centers for Disease Control and Prevention.

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