SUPPORTING STATEMENT
U.S. Department of Commerce
National Institute for Standards and Technology
Analysis of Exoskeleton-Use for Enhancing Human Performance to Complete Industrial Tasks
OMB Control No. 0693-XXXX

A. JUSTIFICATION

1. Explain the circumstances that make the collection of information necessary.

The National Institute for Standards and Technology (NIST) is conducting research on enhancing human performance of industrial tasks while wearing Exoskeleton. Exoskeletons – sometimes called wearable robots – are a very-rapidly expanding domain with a range of applications and a broad diversity of designs. The purpose of this study is to start developing methods to evaluate performance of exoskeletons in two key areas: the fit and motion of the exoskeleton device with respect to the users' body and the impact that using an exoskeleton has on the performance of users executing tasks that are representative of activities in industrial settings. The results of these experiments will inform future test method development at NIST, other organizations, and under the purview of the new ASTM Committee F48 on Exoskeletons and Exosuits.

For the first research topic, we will evaluate a method for measuring the alignment of an exoskeleton to human joint (knee) and any relative movement between the exoskeleton and user. Measurement methods prototyped by NIST for evaluating exoskeleton on mannequin position and motion will be applied to human subjects to verify the usefulness of optical tracking system and designed artifacts worn by users as measurement methods. During the knee test, OTS data, video of the subject performing knee bends, and time are being recorded. For the second research topic, we will evaluate the usefulness of a NIST prototype apparatus for measuring the difference in performance of a person wearing an exoskeleton versus their baseline without the exoskeleton while positioning loads and tools. The NIST Position and Load Test Apparatus for Exoskeletons (PoLoTAE), which presents abstractions of industrial task challenges, will be evaluated in this research.

We intend to publish information on the analysis and results. Because of the diversity of the subject pool and the test methods being evaluated, i.e., not the exoskeleton, we survey the subjects at the end of one or both tests (should they choose to do both tests). The survey is meant to therefore, fill-in details (e.g., previous injuries, sore spots from an exercise routine, etc.) that correlate with the recorded data. The survey also allows the subject to provide any other potentially useful information that may help in the data analysis. For example, perhaps the exoskeleton was awkward to use for the task causing a change in typical task completion.

2. Explain how, by whom, how frequently, and for what purpose the information will be used. If the information collected will be disseminated to the public or used to support information that will be disseminated to the public, then explain how the collection complies with all applicable Information Quality Guidelines.

The survey is administered at the end of the single knee and/or task test(s). The subject may return for future task tests on new days. After all 30 subjects have been tested for one of the six

tasks, the research team will begin correlating survey data with the data collected during the 30 subjects test. The process will repeat for each 30 subjects who participate on the remaining five of the six tasks. The research team provides the survey as part of the knee/task procedure and at the end of the tests. Some or all of the survey data may be publicly disclosed. The consent form addresses this point and provides a choice to the subject whether or not they wish to publicly disclose any information about their test.

3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological techniques or other forms of information technology.

The survey form is in paper format and is completed by the participant. The research team collects the surveys for each and all subjects and locks them in a file drawer in the Primary Investigator's (PI) office.

4. Describe efforts to identify duplication.

This study is unique to the technology created by NIST and therefore is not duplicative.

5. If the collection of information involves small businesses or other small entities, describe the methods used to minimize burden.

Small businesses are not involved in this information collection.

6. Describe the consequences to the Federal program or policy activities if the collection is not conducted or is conducted less frequently.

There are no consequences to any Federal program or policy activities if this collection is not conducted.

7. Explain any special circumstances that require the collection to be conducted in a manner inconsistent with OMB guidelines.

The collection will be conducted in a manner consistent with OMB guidelines. Expiration date and notwithstanding statement will be included on the instrument.

8. Provide information of the PRA Federal Register Notice that solicited public comments on the information collection prior to this submission. Summarize the public comments received in response to that notice and describe the actions taken by the agency in response to those comments. Describe the efforts to consult with persons outside the agency to obtain their views on the availability of data, frequency of collection, the clarity of instructions and recordkeeping, disclosure, or reporting format (if any), and on the data elements to be recorded, disclosed, or reported.

A 60-day Federal Register Notice (FRN) soliciting public comments was published on Friday, June 29, 2018 (Vol. 83, No. 77126, page 30700). No comments or suggestions for improvements were received.

A 30-day Federal Register Notice (FRN) soliciting comments was published on Monday, September 10, 2018 (Vol. 83, No. 175 page 45595). No comments or suggestions for improvement were received.

9. Explain any decisions to provide payments or gifts to respondents, other than remuneration of contractors or grantees.

No payments or gifts are offered to participants. The consent form and the recruitment flyer both state: "There will be no compensation for participation in this study and results of this study are expected to be made public."

10. Describe any assurance of confidentiality provided to respondents and the basis for assurance in statute, regulation, or agency policy.

Some or all of the survey data may be publicly disclosed. Video and photos of the subject performing the task and knee tests may be released with only the subject number. The participant's name will not be released. The consent form addresses this point and provides a choice to the subject whether or not they wish to publicly disclose any information about their test. Should the subject choose to not disclose their information, no personally identifiable information will be disclosed. Although the participant's name may be collected, the storage of information is not in a Privacy Act System of Records which retrieves information based on a personal identifier. This collection does not require a Privacy Act Statement or SORN.

11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private.

No questions of a sensitive nature will be asked of the participants.

12. Provide an estimate in hours of the burden of the collection of information.

The survey regarding the participant's experience using the exoskeleton suit takes approximately 10 minutes to fill out. 30 Subjects may participant in up to 6 separate tasks. The survey will be given after each task to records the experience of using the exoskeleton. There are six task tests for a total of 180 participants at 10 minutes per response equaling 30 hours burden.

13. Provide an estimate of the total annual cost burden to the respondents or record-keepers resulting from the collection (excluding the value of the burden hours in Question 12 above).

There is no cost to the respondent.

14. Provide estimates of annualized cost to the Federal government.

Professional cost: 30 hours x $158 per hour with overhead = $4800.

15. Explain the reasons for any program changes or adjustments.

This is new information collection.

16. For collections whose results will be published, outline the plans for tabulation and publication.

Once data is analyzed, publication of results by subjects who allow public disclosure of their information may occur in written reports, conference papers, journal papers, books and presentations at standards development organization meetings. The data collected will not be reused, other than for the purposes stated above. The data will not be used by NIST in the future beyond the current study analysis and compilation. NIST also plans to publish the collected publicly disclosed data in accordance with NIST guidelines and procedures to allow the research community to develop measurement science beyond allowable NIST resources.

17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons why display would be inappropriate.

The OMB approval information will be displayed. Although personally identifiable information is collected, it is not being stored in a Privacy Act System of Records in which information is retrieved by a persona identifier. Therefore, a Privacy Act Statement and SORN are not applicable for this particular collection.

18. Explain each exception to the certification statement.

There are no exemptions.