

Supporting Statement

Information Collection Request for Postural Analysis in Low-Seam Mines

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Part A and B

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A. Justification

1. Circumstances Making the Collection of Information Necessary

OMB clearance is requested for an existing data collection without an OMB control number. This data collection has already been performed, and the data have been analyzed. This data collection began without OMB approval due to confusion over what forms of data collection fell under OMB. Initially, it was incorrectly thought that the data collected did not require OMB approval because NIOSH personnel were asked by the mines to come in and evaluate their problems with knee injuries. Since NIOSH was invited, the researchers mistakenly thought they did not need to seek approval to ask the mine workers questions.

Background

This information collection Request (ICR) is an existing collection without an OMB control number.

According to the Mining Safety and Health Administration (MSHA) injury database, 227 knee injuries were reported in underground coal mining in 2007. The median days lost due to a knee injury in underground coal operations was 41 days. Low-seam coal mines are those with an extremely low working height (~42"). National Institute for Occupational Safety and Health (NIOSH) researchers have found that the average cost per knee injury in low-seam coal operations was \$13,121.29. Thus, it can be estimated that the financial burden of knee injuries was nearly three million dollars in 2007.

In low-seam mines, mine workers are restricted to kneeling and crawling postures. Many different forms of kneeling and crawling postures have been observed in low-seam mines; however, their frequency and duration of use is unknown. Many things may affect the postures utilized by the mine workers such as the task being performed, the materials they wear on their mine belts, whether or not they have a knee injury, and personal preference. Despite the postures utilized, the effect that each posture has on the knee itself is unknown.

A laboratory study aimed at investigating the effect of posture on the knee was planned. This study would investigate the forces, moments, and stresses at the knee during various postures utilized during low-seam mining. Therefore, it was necessary to first determine which postures warranted investigation. Thus, the data collection described in this documentation was necessary. This data collection was aimed at determining the frequency and duration of various postures used in low-seams. Based on this information, the postures that were ultimately evaluated in the laboratory study were determined.

The laws and regulations authorizing or mandating the data collection are Section 20(a)(1) of the Occupational Safety and Health Act (29 U.S.C 669). A copy of this section of the legislation can be found in Attachment 1.

Privacy Impact Assessment

Overview of the Data Collection System

Data collection was conducted using a series of questionnaires (Attachments 3 to 11). The appropriate headings and footers have been added to the forms. A different questionnaire was developed for each job type investigated: 1) continuous miner operator; 2) foreman; 3) maintenance shift worker; 4) mobile bridge operator; 5) roof bolter operator; 6) scoop operator; 7) shuttle car operator; 8) mechanic; and 9) beltman.

The beginning section of each questionnaire was the same and asked for basic demographic information such as height, weight, and time in the job. Additionally, information was collected to the specific job performed by each individual (e.g. which side of the continuous miner the participant operates the machine from). Next the mine workers were asked to identify the items worn on their belt and to identify the most and least physically demanding tasks they perform. They were also asked to provide comments on the kneepads they use and how they clean them. The mine workers were then asked a series of questions designed to determine if they suffer from a knee injury. The mine workers were also asked to identify, from a schematic, which two postures they utilize most often and what percentage of their day they spend in each. Additionally, the workers were asked to indicate which postures caused the most and least discomfort. Finally, the workers were asked to identify any obscure posture that they utilize that was not pictured in the schematic. The above described data was collected from all mine workers regardless of job type.

Based on their job type, mine workers were then provided with a list of tasks they might do and were asked to identify those that are performed on a daily basis. For each task they listed, they were asked how many hours they spend performing this task on a daily basis, what two postures were most often used, and what percentage of their time doing the task was spent in those postures. If the subject indicated that they used an obscure posture, it was noted.

Initially, the above collected information was used to identify postures that should be evaluated in the laboratory testing phase of project. Additionally, this information, along with the data ultimately obtained from laboratory testing of the forces, moments, and stresses at the knee, were utilized to guide current research efforts aimed at the design of kneepads that may be easily utilized by mine workers regardless of posture, job type, or task.

Thus, information was collected via in-person interviews. Only NIOSH researchers were involved in data collection.

Items of Information to be Collected

Participants needed to provide consent (Attachment 12) to the study and needed to sign a photo release form (Attachment 13). These forms were approved by the NIOSH Human Subject Review Board (Attachment 14). Required on these forms are the subject's names, age, address, and signature. These forms were locked in the Principal Investigator's office at all times.

Identification of Website(s) and Website Content Directed at Children Under 13 Years of Age

No web-based data collection methods were used in this study.

2. Purpose and Use of Information Collection

The data was collected at six different low-seam coal mines by NIOSH, PRL researchers. For each mine, only one data collection was necessary. Those mine workers that worked the normal day shift were approached to see if they were interested in participating in the study (typically 9-12 mine workers are assigned to each shift). All those willing to consent participated in the study (n=64).

For each mine, the data was collected by interviewing each respondent using a questionnaire as a guide (Attachments 3 to 11). The questionnaire used depended upon the primary job type of the respondent (e.g. roof bolter operator, shuttle car operator, mechanic). The information collected was basic demographic information (e.g. age, job type, time in job) and information regarding the postures (e.g. kneeling in full flexion, kneeling at 90° of flexion, duck walking) used by the respondents to perform various tasks associated with their job duties. The demographic information was intended to only be used if discrepancies were noted between respondents of the same job category. These data may indicate why such discrepancies existed. The postural data was the primary focus of the data collection. These data were used to determine which postures were most frequently used to complete specific tasks, were most comfortable, and were least comfortable.

With these data, a second study was designed in the laboratory. This second study does not have OMB approval as no questions were asked of the subjects. However, approval was sought with the Human Subjects Review Board. In this second study, the forces, stresses, and moments at the knee were evaluated with and without kneepads for the postures identified in the data collection described in this OMB package. Thus, this second laboratory study was used to determine which postures were most detrimental to mine workers. From these data, postural rotation strategies and kneepad design elements may be developed to minimize mine worker exposure to harmful forces, stresses, and moments at the knee.

Privacy Impact Assessment Information

The information described above was collected to determine which postures (e.g. kneeling in full flexion, kneeling at 90° of flexion, duck walking, 2-pt crawling, 4-pt crawling) should be evaluated in a laboratory study whereby the forces, stresses, and moments at the knee were determined both with and without kneepads. These data are currently being used to improve the design of kneepads which are the primary method for reducing the risk of developing a musculoskeletal disorder at the knee. Additionally, these data are currently being used to determine which postures are more desirable as they pose less of a risk to the knee. In general, it is recommended that mine workers switch between several postures. Therefore, recommendations of postures to utilize are also being generated for the various job types.

Information in Identifiable Form was collected as part of the consent and photo release process. Specifically, the respondent's name and address was collected. However, it is not possible to link the IIF with the data collected as no IIF was collected on the data collection forms (Appendix 3 to 9). The IIF collected has only been and will only be viewed by NIOSH, PRL researchers and is being maintained in a locked cabinet in the PI's office. These data will only be used if the PI is asked to provide evidence that the data collected was done so with consent from the respondents. According to requirements of the Human Subjects Review Board, these documents must be maintained for 20 years.

3. Use of Improved Information Technology and Burden Reduction

In-person interviews were used in this study. General literacy is a problem in the mining community. For those that can read, the average reading level is only at the eighth grade level. Computer literacy is an additional problem. Therefore, any computer based data collection methods would be undesirable. Furthermore, due to the general literacy problem, in-person interviews were believed to be the most effective way to obtain the information.

4. Efforts to Identify Duplication and Use of Similar Information

The following are brief descriptions of work performed by the Bureau of Mines and NIOSH to address ways to better protect the knees of low-seam miners.

In March 1974 the report titled Testing of Prototype Knee Protective Devices published findings from a field study on a kneepad prototype. A qualitative review of nine kneepads ranked the prototype kneepad second. Even with prototype modifications, the resulting conclusion of this study was that kneepads of the user's preference should be issued to all those who work in low-seam coal.

In 1978, the U.S. Bureau of Mines released a report titled, Use of Personal Equipment in Low Coal: A Review of the Personal Equipment Literature. This document encompassed many different types of personal protective equipment one of which being kneepads. The resulting general recommendations from this report proposed that a kneepad should be designed specifically for use in low-seam mines.

A study conducted by Sanders in 1982 revealed eight characteristics preferable for a kneepad designed for low-seam mining. A prototype kneepad containing all eight design elements was field tested for a limited period of time, but testing ended prematurely due to the lack of durability of the prototype. The eight design features were: "V" shaped foam pads, durable hard outer shell, high side walls, cut-out for accommodating thigh, single strap design, wide soft strap, belt-buckle single prong strap and air cushion. From subjective data collected from miners, it was determined that three of the design features were preferable. The three features were the "V" shaped foam pad; high side walls; and single strap construction.

In March of 1986, the Bureau of Mines published a report titled, Personal Equipment for Low Seam Coal Miners: Improved Knee Pads, a Modified Design. This report completed the second phase of the Sanders 1982 work. The attempt was made to use the Sanders prototype as a starting point, but from there develop a more durable kneepad that would withstand the

harsh environment of a mine. The work was unsuccessful in developing a kneepad given the design elements and readily available materials.

In addition to literature searches, the principal investigator of this study has attended numerous cross-sector meetings within NIOSH that focus on reducing musculoskeletal disorders in the workplace. The principal investigator had personal discussion with the attendees and also presented their research at one of the meetings. At these meetings only one relevant research project was identified. Within NIOSH, a kneel-assist device was designed to aid ship yard workers. However, upon receiving the drawings and prototypes of this device, it was clear that the design would not function in the mining environment due to the existence of mud and wetness.

The review of the literature indicated that the postures utilized by low-seam coal mine workers were still not documented. Additionally, at this time, there exists no kneel-assist device that is superior to the kneepads commonly used in the mining industry today. Therefore, there exists a need to design new kneel-assist devices. The long-term goal of the PI's work is to design novel kneel-assist devices that reduce the forces, stresses, and moments at the knee while being durable enough to withstand the mining environment. However, lessons learned from the previous work will be incorporated into the new prototype designs. It is believed that significant advances in materials science and manufacturing techniques will allow for the successful design of new kneel-assist devices despite the failed attempts in the past.

5. Impact on Small Businesses or Other Small Entities

The questionnaires (in-person interviews) were administered to individuals not to businesses. These individuals were working for mining companies that were willing to cooperate with their workers' participation. Two different mining companies participated, each allowing three different mining sites to cooperate with our data collection. Burden was minimized as data collection at each mine site occurred only once with respondents only being interviewed once each. Additionally, interviews were conducted prior to the start of the shift (i.e. no interference with work tasks) or during natural breaks in the working process (e.g. roof bolter operator waiting for continuous miner operator to finish a cut).

6. Consequences of Collecting the Information Less Frequently

Data was only collected once at each participating mine site.

There are no legal obstacles to reduce the burden.

7. Special Circumstances Relating to the Guidelines of 5 CFR 1320.

This request fully complies with the regulation 5 CFR 1320.5.

8. Comments in Response to the Federal Register Notice and Efforts to Consult Outside the Agency

A 60-day Federal Register notice was published in the *Federal Register* on June 24, 2009, vol. 74, No. 120, pp. 30096-97. (Attachment B). No comments have been received.

Several mine safety and health representatives/directors at cooperating mines were contacted at the onset of this study. These individuals provided information regarding the postures that should be included on the data collection forms. They also assisted in the generation of the list of tasks performed by the various job types. Since the existence of a knee injury may be the primary driving factor behind an individual's selection of posture to utilize while performing a task, questions were generated to determine whether or not a mine worker was likely to suffer from a serious knee injury (diagnosed or undiagnosed). These questions were formulated with the assistance of a Physical Therapist at the University of Pittsburgh, Department of Physical Therapy.

9. Explanation of Any Payment or Gift to Respondents

The respondents did not receive any payment or gift for their participation in this study.

10. Assurance of Confidentiality Provided to Respondents

Privacy Impact Assessment Information

The respondents signed a consent form and a photo release form. These consent forms informed the respondents that the study is voluntary and that they may leave the study at any time. The forms included the name, age, signature, and address. However, this information was not linkable to the data collected. Therefore, the Privacy Act does not apply to this information. These forms were secured in a locked cabinet in the PI's office. The consent form (Attachment 12) was approved (Attachment 14) by the NIOSH Human Subjects Review Board.

11. Justification for Sensitive Questions

The questionnaire did not contain any potentially sensitive questions.

12. Estimates of Annualized Burden Hours and Costs

A. Estimated Annualized Burden Hours

Respondents	Form Name	No. of Respondents	No. of Responses per Respondent	Average Burden per Response (in hours)	Total Burden (in hours)
Continuous Miner Operator	Continuous Miner Operator Form	5	1	10/60	1
Foreman	Foreman Form	5	1	10/60	1
Maintenance Shift Worker	Maintenance Shift Worker Form	10	1	10/60	2
Mobile Bridge Operator	Mobile Bridge Operator Form	10	1	10/60	2
Roof Bolter Operator	Roof Bolter Operator Form	14	1	10/60	2
Scoop Operator	Scoop Operator Form	6	1	10/60	1
Shuttle Car Operator	Shuttle Car Operator Form	6	1	10/60	1
Mechanic	Mechanic Form	6	1	10/60	1
Beltman	Beltman Form	2	1	10/60	0.5
Total					12

B. Estimated Annualized Burden Costs

Type of Respondent	Form Name	No. of Respondents	No. of Responses per Respondent	Total Burden (in hours)	Hourly Wage Rate	Total Respondent Cost
Continuous Miner Operator	Continuous Miner Operator Form	5	1	1	\$24.42	\$122.10
Foreman	Foreman Form	5	1	1	\$24.42	\$122.10
Maintenance Shift Worker	Maintenance Shift Worker Form	10	1	2	\$24.42	\$488.40
Mobile Bridge Operator	Mobile Bridge Operator Form	10	1	2	\$24.42	\$488.40
Roof Bolter Operator	Roof Bolter Operator Form	14	1	2	\$24.42	\$683.76
Scoop Operator	Scoop Operator Form	6	1	1	\$24.42	\$146.52
Shuttle Car Operator	Shuttle Car Operator Form	6	1	1	\$24.42	\$146.52
Mechanic	Mechanic Form	6	1	1	\$24.42	\$146.52
Beltman	Beltman Form	2	1	0.5	\$24.42	\$24.42
Total						\$2368.74

The hourly wage was determined by the United Mine Workers of America (UMWA), rate 5 for 2008 (\$24.42 per hour).

13. Estimates of Other Total Annual Cost Burden to Respondents or Record Keepers

The interviews had no capital, operating, or maintenance costs for the respondents or their employers. The only cost to the respondents was the time required to complete the interviews/questionnaires.

14. Annualized Cost to the Government

One cost to the government was for NIOSH, PRL researchers to travel to each mine site. Six trips were conducted in Pennsylvania. The total cost of these six trips to the government was \$380 since many of the trips were within one day's travel of the NIOSH, PRL research facilities.

The six trips consumed approximately 144 hours of NIOSH researchers' time. Salaries for members of the NIOSH team range from approximately \$40,000 to \$115,000 a year. This yields an hourly wage of approximately \$20 to \$60. Using an average hourly wage of \$40, this resulted in a cost of approximately \$5,760.

The total cost to the government is approximately \$6140.

15. Explanation for Program Changes or Adjustments

This was a new information collection.

16. Plans for Tabulation and Publication and Project Time Schedule

Project Phase	Time Schedule
Interview subjects/data collection	completed from 8/07-12/08
Data analysis	completed
Publication of results	6 months after OMB approval

17. Reason(s) Display of OMB Expiration Date is Inappropriate

The OMB expiration date was not displayed on the questionnaires as it was not known at the time that OMB approval was necessary for data collection. The required OMB information on questionnaires has been added subsequently.

18. Exceptions to Certification for Paperwork Reduction Act Submissions

There are no exceptions to the certification statement.

B. Collections of Information Employing Statistical Methods

1. Respondent Universe and Sampling Methods

The respondent universe are mine workers at low-seam, continuous mining, coal mines. Typically, each working section of such a mine has approximately 9-12 members. Six mines sites (2 mining companies) were sought for this study. All members of the participating mines interested in participating in the study were accepted. No respondent selection method was used and there were no exclusion criteria. The mine companies that participated in this study were Rox Coal and TJS Mining, both located in Pennsylvania.

Respondents were not provided with any financial incentive such as a gift or reimbursement. Data was only collected at one time point and all respondents completed the full interview. Therefore, the response rate was 100%. Statistical methods were not used to determine the sample size. Rather, budgetary constraints and practicality were balanced.

2. Procedures for the Collection of Information

Data collection was performed via interviews by NIOSH, PRL researchers. NIOSH, PRL researchers generated questionnaires (Attachments 3 to 11) to make the interviews consistent across interviewers. The interviewer marked the respondent's answer directly on the questionnaire. NIOSH, PRL researchers scheduled a day in advance with the mine company to conduct the interviews. After each visit to a participating mine, the interviewers met with the study coordinator to discuss any issues, concerns, or any other useful information. This helped to serve as quality control.

3. Methods to Maximize Response Rates and Deal with Nonresponse

Data was only collected at one time point. Thus, simply completing the interview would count as a full response. The questionnaires were designed to take approximately 10 minutes of the respondent's time. This was ideal since natural breaks in the mining process frequently are no longer than 10 minutes. Additionally, most respondents show up pre-shift to prepare for the day. During that time, they typically can set aside 10 minutes. All respondents completed the interviews yielding a 100% response rate.

4. Tests of Procedures or Methods to be Undertaken

The entire team of NIOSH, PRL researchers belonging to the Musculoskeletal Prevention Team was consulted on the development of the questionnaires used to guide the interviews. Additionally, conversations with stakeholders (industry safety and health representatives) were undertaken in order to develop the list of postures to be investigated. These individuals also evaluated the clarity of the stick figure drawings used to describe each posture.

5. Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data

The entire team of NIOSH, PRL researchers belonging to the Musculoskeletal Prevention Team was consulted on the development of the questionnaires used to guide the interviews.

The measurement data was collected and reviewed by NIOSH, PRL researchers. The individuals are:

Sean Gallagher (NIOSH) 412-386-6445
Jonisha Pollard (NIOSH) 412-386-5220
William Porter (NIOSH) 412-386-5222
Alan Mayton (NIOSH) 412-386-4657
Susan Moore (NIOSH) 412-386-6613
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