HETA 96-0213-2638
Oscar Mayer Foods
Madison, Wisconsin

Veronica Herrera-Moreno, M.D.
Daniel J. Habes, M.S.E., CPE

PREFACE

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ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Veronica Herrera-Moreno, M.D., of the Hazard Evaluations and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS), and Daniel J. Habes, M.S.E., CPE, of the Applied Psychology and Ergonomics Branch, Division of Biomedical and Behavioral Science (DBBS). Field assistance was provided by John Fox, Eric Hands, and Jeanette Tierney, State of Wisconsin Division of Health. Desktop publishing by Patricia C. McGraw.

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SUMMARY

On July 3, 1996, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from the United Food and Commercial Workers International Union, Local 538, at Oscar Mayer Foods Corporation, in Madison, Wisconsin. The request mentioned strains and repetitive motion injuries affecting workers in one of the wiener processing departments (WPD) at the plant.

NIOSH representatives conducted a site visit on August 28-30, 1996. This site visit included an opening conference, attended by management and union representatives; a walk-through inspection of the WPD; videotaping of the job tasks; confidential, voluntary medical interviews with workers from the WPD; review of medical records and the Occupational Safety and Health Administration (OSHA) Log and Summary of Occupational Injuries and Illnesses (the OSHA 200 log); and a closing conference. A second site visit was conducted on December 9-10, 1996. This visit resulted in the gathering of more detailed health information about the workers using a standard questionnaire. It was also determined that since the first visit, the number of workers assigned to some jobs had been reduced, which required an updated analysis of the ergonomic stress factors of the job tasks in the WPD. NIOSH investigators also presented an overview of the ergonomic analysis to union officials and company representatives.

The jobs in the WPD were comprised of many ergonomic risk factors, including lifting, repetitive motions, and awkward postures. However, in general, the number of workers assigned to the jobs and the rest periods provided, moderate the risk of injury to workers.

Thirty-one of 38 (81%) workers from the WPD agreed to be interviewed. Of these, 17 (55%) reported elbow/wrist/hand pain, 15 (48%) reported low back pain, 14 (45%) reported shoulder pain, 10 (32%) reported neck pain, and 7 (23%) reported foot pain, occurring at least once in the last year. These symptoms were reported by the workers to be job-related because the symptoms appeared after working in this workplace and were not related to previous injuries. The OSHA 200 log from December 1, 1990 (when the department started operating), until August 4, 1996, showed a total of 60 entries. Of these, 30 (50%) were for musculoskeletal disorders, with a total of 47 work days lost and 758 light duty days reported for these work-related disorders. During the time period analyzed, the annual entries for MSDs were as follows: 1991--six entries; 1992 --seven; 1993 -- six; 1994 --six; 1995--four; 1996 (August 4) --one.

Based on the information and data obtained during this HHE, NIOSH investigators conclude that jobs in the WPD include many job ergonomic stress factors. In general, the number of workers assigned to the jobs and the rest periods provided by the rotation system moderate the risk for work-related MSDs in those jobs where ergonomic hazards are present. Recommendations for changes in job design and worker practices aimed at further reducing the number of recordable injuries are offered in this report.

KEYWORDS: SIC 2013 sausages and other prepared meat products, ergonomics, musculoskeletal disorders, carpal tunnel syndrome, low back injuries, neck and shoulder pain, foot pain.

TABLE OF CONTENTS

INTRODUCTION

On July 3, 1996, the National Institute for Occupational Safety and Health (NIOSH) received a request from the United Food & Commercial Workers International Union, Local 538, for a health hazard evaluation (HHE) at the Oscar Mayer Foods plant in Madison, Wisconsin. The request specified ergonomic hazards from lifting excessive weight, and repetitive motion hazards due to excessive line speeds in one of the wiener processing departments (WPD) where wieners are formed, cooked, and packaged.

NIOSH representatives conducted a site visit on August 28-30, 1996. This site visit included an opening conference, attended by management and union representatives; a walk-through inspection of the WPD; videotaping of the job tasks; confidential, voluntary medical interviews with workers from the WPD; review of medical records and the Occupational Safety and Health Administration (OSHA) Log and Summary of Occupational Injuries and Illnesses (the OSHA 200 log); and a closing conference. A second site visit was conducted on December 9 and 10, 1996. This visit resulted in the gathering of more detailed health information about the workers, using a standard questionnaire. It was also determined that since the first visit, the number of workers assigned to some of the jobs had been reduced, which required an updated analysis of the ergonomic stress factors of the job tasks in the WPD. NIOSH investigators also presented an overview of the ergonomic analysis to union officials and company representatives.

BACKGROUND

In 1919, the Oscar Mayer Meats Company purchased the Farmers Packing Company in Madison, Wisconsin, to provide a livestock purchasing and processing facility for the Chicago-based sausage company. Since then, the company moved its headquarters to Madison and has substantially grown. Oscar Mayer Co. discontinued slaughtering at this plant in the early 1980's to concentrate on meat processing and packaging. The Madison Plant remains the largest of the company's several manufacturing facilities.

The Madison Plant currently has 34 manufacturing operations which produce over 278 different products. This plant employs over 2,000 workers, of which one fourth are female. Workers average 41 years of age and 13 years seniority with the company. The plant operates on the unit concept (or plant within a plant). There are five production units, one materials handling or shipping unit, and one maintenance unit. Several departments work continuous operations and are staffed around the clock.

The WPD was started in 1990, for the purpose of producing "Lite" products. There are 38 people currently employed in the WPD, working in three shifts: 17, 16, and 5 workers for first, second, and third shifts, respectively. The job titles in this area are batcher, grinder, linker, stripper, inspector, drop station operator, scaler, utility machine operator, relief, and sanitation operator.

Job Descriptions

Linker

Two jobs were evaluated in the Linker area: "stuffing" and "loading" (also called "carrying"). There is also a job called "utility" which is performed by both the stuffers and the loaders. The stuffers operate the machines that form the wiener links. The stuffers keep the forming machines stocked with wiener casings and guide the links onto metal racks or "smokesticks." The smokesticks are 80" long, weigh either 6 ½ or 7 ½ pounds (lbs.) and, when fully draped with wiener links, weigh approximately 38-43 lbs. For the most common wiener processed (which was in production during the NIOSH evaluation), the total weight is about 39 - 40 lbs. The ambient temperature in the area in which these jobs are performed is usually about 50-55 ˚F. The floors were made of brick, and were usually wet.

The carrier manually transports the loaded smokesticks from the two link-forming machines to the oven or "smokehouse." The first linking machinewas located about 5 feet from the smokehouse and the second was situated about 15 feet from the smokehouse. The stuffers carry clean smokesticks received from the "stripper" area back to the linking machines. The clean smokesticks are retrieved from a conveyor located above the oven. The four workers in the Linker area rotate from the two stuffing machines to the carrying job and to the utility position at ½ hour intervals. The utility position involves some maintenance and clean up activities, but generally provides a break from the lifting and carrying tasks that take place in the Linker area. Seasonal fluctuations in demand for wieners sometimes result in the Linker area being staffed by three workers for a few hours during the work day.

Stripper

Three workers perform the jobs in this area, which are called "unload," "stripping," and "utility." The unloader removes the smokesticks from the oven and delivers the wieners to the stripper. This involves lifting the smokestick off hooks and allowing one end to drop to the bottom of a bin that holds the wieners to be stripped. The length of the smokestick requires that some amount of force be added by the worker to ensure that all the wieners slide off the smokestick and into the bin. The bottom surface of the bin is made of hard plastic. The unloader then places the empty smokestick on an overhead conveyor which, after cleaning, is delivered back to the Linker area. There is a two-tiered rack located behind the normal position of the worker for temporary storage of filled smokesticks during instances when the stripper can not accept cooked wieners.

The stripper stands adjacent to the bin containing the unloaded wieners and funnels them by hand into a machine which removes the casing. The stripped wieners fall onto a conveyor belt which delivers them to the Packaging area. The stripper and the unloader normally rotate between these two jobs and the utility position every ½ hour. As in the Linker area, the utility position requires some maintenance activities by the worker, but generally provides a break from the lifting and handling tasks that take place in the Stripper area. Occasionally, this area is operated by two people, depending on production demands and personnel staffing needs elsewhere in the WPD.

Packaging

The jobs located in this area are called "inspector," "drop station," "scaler," and "utility machine operator" (UMO). There are also two "utility" positions that workers rotate through, as in the Linker and Stripper areas. Conveyor belts from the Stripper area deliver wieners to two inspectors who screen the wieners for quality characteristics and add wieners to empty slots on the conveyor line. These workers have the option of sitting or standing. After inspection, the wieners are delivered to two stations where they are dropped into boxes that hold ten pounds of product. The drop station attendants, who mostly sit, position and align the boxes on the conveyor line, and occasionally add wieners to the boxes before releasing them to the scaler.

Both drop stations deliver to one scaler, who weighs the boxes, adds or removes wieners as needed, loosely closes the plastic bag lining the box, and releases them to an automatic box sealer and palletizer. The UMO is a utility worker whose main function is to keep the line supplied with packaging materials. The plastic bags are inserted automatically into the boxes before being delivered to the drop stations. The eight workers in the packing department either rotate through the six jobs and the utility positions at ½ hour intervals or remain at one position for several ½ hour intervals, depending on staffing levels and personnel needs within the department. As in the other areas of the WPD, the Packaging area is occasionally staffed by fewer workers (usually six) for periods of time during the work day.

METHODS

Ergonomic

The ergonomic evaluation consisted of a walk-through survey and subsequent videotaping of each job in the WPD. Because the jobs in the WPD involved lifting, carrying and walking, and repetitive motions of the upper extremity, they were evaluated using three ergonomic exposure assessment methodologies: the NIOSH Revised Lifting Equation (NLE), an estimation of energy demands, and the Strain Index (SI). [These are further described in the Evaluation Criteria section, below and illustrated in the Appendix.] The necessary information to use these exposure assessment methods was either collected/measured during the walk-through survey or obtained through analysis of the video tapes.

Medical

The medical portion of this HHE included a review of the OSHA Log and Summary of Injuries and Illnesses (Form 200) for December 1, 1990, to August 4, 1996, and voluntary, confidential medical interviews with 31 of 38 workers (82%) from the WPD. Information obtained from the interviewed employees, both in the open interview and through standard questionnaires in the second site-visit, included demographic data, work history, medical history, and work-related musculoskeletal symptoms.

EVALUATION CRITERIA

Ergonomic

Overexertion injuries, such as low back pain, tendinitis, and carpal tunnel syndrome, are often associated with job tasks that include: (1) repetitive, stereotyped movement about the joints; (2) forceful exertions; (3) awkward work postures; (4) direct pressure on nerves and soft tissues; (5) work in cold environments; or (6) exposure to whole-body or segmental vibration (Armstrong, Radwin, and Hansen, 1986; Gerr, Letz, and Landrigan, 1991; Rempel, Harrison, and Barnhart, 1992). The risk of injury appears to be increased as the intensity and duration of exposures to these factors are increased and the duration of recovery time is reduced (Moore and Garg, 1995). Although personal factors (e.g., age, gender, weight, fitness) can affect an individual's susceptibility to overexertion injuries/disorders, studies conducted in high-risk industries show that the risk associated with personal factors is small when compared to that associated with occupational exposures (Armstrong et al., 1993).

In all cases, the preferred method for controlling/preventing work-related MSDs is to design jobs, workstations, tools, and other equipment items to match the physiological, anatomical, and psychological characteristics and capabilities of the worker. Under these conditions, exposures to task factors considered potentially hazardous will be reduced or eliminated to the extent feasible.

Because of the multifactorial nature of work-related musculoskeletal disorders, there are no completely validated models for predicting the risk of injury associated with specific jobs or job tasks. However, the Strain Index (SI) has been proposed as one possible method for discriminating between jobs associated with upper extremity disorders versus jobs that are not. The SI, which is intended to predict the risk of "distal" upper extremity disorders (from the elbow to the fingertips), is comprised of six factors that have been related to overexertion injuries to the upper extremity. The numerical score is the product of six logarithmic multipliers that correspond to (1) intensity of exertion, (2) duration of exertion, (3) exertions per minute, (4) hand/wrist posture, (5) speed of work, and (6) duration of task per day. The SI score can theoretically range from less than 1 (all factors at the minimum level) to over 1000 (all factors at the maximum level). A practical upper limit for the SI score is currently not known. Preliminary research indicates that jobs with SI scores less than or equal to 3 are probably safe,

between 3.1 and 7, are a "tough call," requiring caution and professional judgement on the part of the analyst, and jobs with scores greater than 7 are probably hazardous (Moore and Garg, 1995). Jobs in the middle or "tough call" category represent a gray area in the continuum of risk of injury to workers. For jobs classified in this category, the likelihood of injury to workers may be influenced by factors other than physical job demands, such as the age and fitness of workers, or rotation and/or work-rest patterns that are administratively set into place.

The NIOSH Lifting Equation (NLE) is a tool for assessing the physical demands of two-handed lifting tasks (Waters et al., 1993). A full description of the NLE is provided in Appendix A. In brief, the equation provides a Recommended Weight Limit (RWL) and a Lifting Index (LI) for a lifting task, given certain lifting conditions. The RWL is the weight that can be handled safely by almost all healthy workers in similar circumstances. The LI is the ratio of the actual load lifted to the RWL. Lifting tasks with an LI $\leq$ 1.0 pose little risk of low back injury for the majority of workers. Tasks with an LI > 1.0 may place an increasing number of individuals at risk of low back injury. Many researchers believe that tasks with an LI > 3.0 pose a risk of back injury for most workers (Waters et al., 1993).

Another method for evaluating the physical demands of a job is to measure or estimate the oxygen consumption required to perform the various activities that comprise the total work task. This is important if a job includes physical activities other than lifting or repetitive hand motions. Jobs having high metabolic demands can cause fatigue and lead to an injury. An estimation of the energy demands of jobs was developed by the authors of a widely-used ergonomic design textbook (Eastman Kodak, 1986) based on some classical energy expenditure and work physiology research (Garg, Chaffin, and Herrin, 1978; Passmore and Durnin, 1955). The method involves assigning points to jobs based on primary demands such as manual handling, climbing, and application of force. These activities are rated according to degree of effort and duration of each of the tasks. Additional points are scored for supplementary activities that accompany the primary activities such as standing/walking, restrained postures, visual or auditory requirements, external pacing, use of small muscle groups, and short-duration heavy efforts. The supplementary activities are scored using the same degree and duration of effort criteria. When the scores are combined, an estimate of the average oxygen consumption for a day's work is the result. The tables used to score jobs are shown in Appendix C. The point scores awarded for various work activities are weighted in such a way that a score of 100 is intended to indicate an oxygen consumption rate of 1 liter per minute, or 5 kilocalories of energy per minute, which is considered to correspond to heavy lifting as defined by the NLE for manual lifting. When the results from a work physiology study on 21 jobs were compared to the estimated effort levels using this method, the correlation between total points and average oxygen consumption on the job was 0.83 (Rogers, Caplan, and Nielsen, 1976). It is important to note, however, that the more a point score is comprised of supplementary activities, the less direct is the relationship between score and oxygen consumed.

RESULTS

Ergonomic

Results for the jobs in the WPD that were evaluated using the three methods are presented for both normal and seasonal staffing levels. In some cases, the results for the two categories are different from each other because the reduction in workers due to the seasonal staffing levels has the net effect of changing the work-rest patterns of the workers. In some cases, the seasonal staffing levels resulted in some workers performing additional work tasks during a rotational period even if the work-rest pattern was not affected. Work-rest patterns and the number and types of work tasks performed in a period of time have an effect on the measures that were used to evaluate the jobs.

The Strain Index (SI)

The scoring sheet for the SI is shown in Appendix B. The following table lists the score for the jobs evaluated using this method.

Job Name	Strain Index score Normal/Seasonal Staffing
Linker (Stuffer)	2.3
Loader (carry job)	15
Stripper	1.7
Unloader	6.8
Drop Station	1.5
Inspector	3
Scaler (weigh station)	6.8
UMO	1

The carry (load) job in the linking area fits into the "hazardous" category, the unloader and scaler into the "tough call" category, and all others in the "safe" category. These scores take into account the duration that each job is performed daily according to the rotation patterns in place in each department.

The factors which accounted for the difference in scores between the load and the unload jobs, which handle nearly the same load, were the duration of exertion and the speed of work. Whereas the unloader removes the smokestick from the oven and immediately dumps the wieners onto the stripping table, the loader bears the weight of the filled smokestick for the period of time it takes to carry it to the oven. The measured times for this activity were 5 seconds per cycle (cycle time =15 seconds) for the near linker, and 7 or 8 seconds per cycle for the far linker. The speed of work score was higher for the loader than for the unloader because in order to load about four smokesticks per minute, the loaders walk fairly fast between the linking machines and the oven, particularly when carrying from the far linker. Some amount of impulse force is transmitted to the unloader as the smokestick is dropped onto the plastic surface of the bin on the stripping table, but its effect could not be evaluated by the SI.

The NIOSH Lifting Equation (NLE)

The NIOSH revised lifting equation (NLE) was used to evaluate only the load and unload jobs because the other jobs did not involve significant repetitive lifting, although the stuffer position does require the worker to remove a smokestick from above the oven and carry it to the linking machine. The UMO and the scaler job in the Packaging area also required some occasional lifting and miscellaneous materials handling.

Loader

The following assumptions were made in calculating the lifting index for the loader job:
Weight of load (W) = 40 lbs;
Distance of load from the body (H) = 12 inches
Initial lift height (V_0) = 48 inches;
Final lift height (V) = 40 inches;
Asymmetry (A) = no adjustment
Coupling (C) = good;
Frequency of lift (F) = 4/minute;
Lifting period = short duration.
RWL= 51 x 0.83 x 0.87 x 1.0 x 1.0 x 1.0 x 0.84 = 30.9 lbs.
LI = 40/30.9 = 1.3.

The LI for the load job under the conditions where the Linker area is staffed by three workers (which results in two workers linking and carrying for two hours per day) = 1.5.

Unloader

The following assumptions were made in calculating the lifting index for this job:
W = 38 lbs.;
H = 12 in.;
V_0 = 42.5 in. (one hand at 45 in, the other at 40 in.);
V = not inputted because load is dropped without need for significant control;
A = no adjustment
C = good;

F = 4/min.;
Lifting period = short.

RWL = 51 x 0.83 x 0.91 x 1.0 x 1.0 x 1.0 x 0.84 = 32.4 lbs.
LI = 38/32.4 = 1.2
The LI for the unload job under conditions where the stripper and the unloader rotate every ½ hour for the entire day, with breaks provided by utility workers (seasonal staffing) = 1.4.

Since the unloader also hangs the empty smokestick on a hook conveyor above the oven, a lifting analysis was done on this portion of the job with the following assumptions:
W = 7.6 lbs.;
H = 15 in.;
V_0 = 42.5 in.;
V = 70 in.;
A = no adjustment;
C = good;
F = 4/minute;
Lifting period = short duration.
RWL = 17.9 lbs.
LI = 0.4

This analysis would also apply to the portion of the stuffer position in which smokesticks are lifted and carried to the linking machine.

Note: the measured height of the hands at the moment the smokestick is placed on the hook was 78 inches, but the NLE does not provide a RWL for lifts made above 70 inches.

The combined lifting index for the two jobs = 1.2 (normal staffing), and = 1.4 (seasonal staffing with two workers rotating between unloading and stripping).

One aspect of the unload job that could have an effect on the LI is the temporary storage of wieners on an auxiliary rack in cases where the smokehouse production exceeds the capacity of the stripper or the packaging department. This happened during the time of the NIOSH visit due to a breakdown in one of the drop stations. The use of this auxiliary rack can affect the LI by changing the height at which wieners are lifted (two tiers, 64 inches and 44 inches) and by potentially doubling the frequency of lifting. There were 3 instances of double handling during a video tape sequence lasting 6 3/4 minutes, and 4 during a video sequence lasting 7 1/4 minutes. During these same sequences, the average number of lifts from both the smoke house and to and from the auxiliary rack was about 3.7 per min., which indicates that during those times, other adjustments in the production process were made to maintain the flow of wieners to the Packaging Department at or near normal levels.

The LI's for the load and unload jobs for all the staffing scenarios evaluated exceed the NIOSH recommendation of 1.0, which signifies safe lifting conditions for nearly all of the working population, but are less than 3, which is a LI generally considered to represent hazardous lifting conditions for all but the strongest workers. The risk of low back injury is assumed to increase as the LI begins to exceed 1, but the manner and magnitude of the increased injury risk is not known.

Estimation of Energy Expenditure

The energy expenditure scores were highest in the linker and stripper areas (118 and 102 respectively), for the normal staffing. Only the scaler job, in the packaging department, exceeded the value of 100, explained in the evaluation criteria. For all the jobs evaluated, the energy expenditure scores ranged from 35 to 162, depending on the rotational scheme and/or staffing level being considered.

The following tables are a compilation of the scores for the primary and supplementary activities associated with each job. The main elements of the energy expenditure estimation are shown in Appendix C.

Linker

Primary Activities	Daily Duration* Normal Staffing	Seasonal Staffing	Points Normal	Seasonal
Load Smokehouse	25%	41%		
Lift Links			16	38
Carry Links			16	38
Stuffer Job	50%	47%		
Lift Smokesticks			19	19
Carry smokesticks			19	19
Utility	25%	24%	0	0
Supplementary Activities				
Standing/walking	75%	76%	22	22
Fixed External	75%	76%	13	13
Pace	50%	59%	13	13
Use of small muscles				
Total			118	162

*Percentage of the day this work task is performed

Scoring note: Attending to the linking machines was considered to be a supplementary activity accounted for by the "use of small muscles" category. Also, percentages exceed 100 for the seasonal staffing durations because for portions of the work day, workers are performing "loading" and "stuffing" tasks during the same work period.

Stripper

Primary Activities	Daily Duration Normal Staffing	Seasonal Staffing	Points Normal	Seasonal
Stripper				
light application of force	33%	44%	19	19
Unload	33%	44%		
Lift Links			38	38
Lift Smokesticks			10	10
Utility	33%	12%	0	0
Supplementary Activities				
Standing/Walking	66%	88%	22	22
Fixed External	66%	88%	13	13
Pace				
Total			102	102

Scoring note: Feeding the links of wieners through the stripping machine was considered a primary activity and therefore not scored as "use of small muscles" in the supplementary activities.

Packaging - Whole Department

Primary Activities	Daily Duration Normal Staffing	Seasonal Staffing	Points Normal	Seasonal
Inspector	25%	27%		
None			0	0
Drop Station	25%	27%		
None			0	0
Scaler-weigh station	12.5%	14%		
Lift boxes off line			10	10
UMO	12.5%	14%	0	0
None				
Utility	25%	18%	0	0
None				
Supplementary Activities				
Use of small muscles	75%	82%	22	22
Visual load with restricted head and neck posture	37.5%	41%	0	0
Fixed external pace	62.5%	68%	13	13
Standing/walking	62.5%	68%	22	22
Restrained posture (sit)	37.5%		0	0
Awkward sitting posture	27%		13	13
	25%	27%		
Total			80	80

Scoring notes: Only the inspector and the scaler jobs were considered to have visual requirements. The UMO operator was not considered to be paced externally. Since the inspectors had the option of sitting or standing, the 25% working period was split between the two activities, but was not considered restrained posture.

Scaler Job

Primary Activities	Daily Duration Normal Staffing	Seasonal Staffing	Points Normal	Seasonal
Scaling	75%	82%		
Lift boxes off line			38	38
Utility	25%	18%	0	0
Supplementary Activities				
Use of small muscles	75%	82%	22	22
Visual load - medium	75%	82%	13	13
Fixed external pace	75%	82%	13	13
Standing/walking	75%	82%	22	22
Total			108	108

Drop Station

Primary Activities	Daily Duration Normal Staffing	Daily Duration Seasonal Staffing	Points Normal	Points Seasonal
None	75%	82%	0	0
Utility	25%	82%	0	0
Supplementary Activities				
Use of small muscles	75%	82%	22	22
Fixed external pace	75%	82%	13	13
Awkward posture > 5% of time (cramped seating)	75%	82%	13	13
Restrained posture (sit)	75%	82%	0	6
Total			48	54

Scoring note: Must sit > 75% of the time to score as a supplementary activity.

Inspector

Primary Activities	Daily Duration Normal Staffing	Daily Duration Seasonal Staffing	Points Normal	Points Seasonal
None	75%	82%	0	0
Utility	25%	18%	0	0
Supplementary Activities				
Standing/walking	25%	27%	13	13
Fixed external pace	75%	82%	13	13
Use of small muscle groups	75%	82%	22	22
Visual load	*75%	82%	22	22
	*hard to detect			
Total			70	70

UMO

Primary Activities	Daily Duration	Points
None	75%	0
Utility	25%	0
Supplementary Activities		
Standing/walking	75%	22
Use of small muscle groups	25-50%	13
Total		35

Note: The seasonal staffing levels did not affect the score for the UMO because the UMO does not regularly rotate with the rest of the department.

The "Whole Department" energy consumption analysis is intended to estimate the demands of the jobs in the Packaging Department for the case where there is full rotation through every position in the department at ½ hour intervals. The individual analyses estimate the energy expenditure for workers in a non-rotational scheme working for 1 ½ hours at a position followed by a ½ hour rotation to the utility/break position, with return to the same position after the break from normal job activities. As was noted in the **job descriptions**, there is not always a fixed pattern of rotation in the Packaging Department due to variations in production and personnel. The most representative estimate of the energy demands of individuals in the Packaging Department likely lies somewhere between the "whole department" rotation analysis and the "no rotation" analysis presented above.

Medical

OSHA 200 Logs Review

From December 1, 1990, (when the WPD started operations) through August 4, 1996, the WPD had a total of 60 entries on the OSHA 200 log, of which 30 were for musculoskeletal disorders (MSDs). Five entries (four for low back pain and one for neck strain) resulted in 47 lost work days. The five entries with lost work days, plus another 19 entries resulted in light duty assignments totaling 758 days.

The OSHA 200 log entries included the following conditions: back strain (10 entries), shoulder strain/tendinitis (9 entries), wrist disorders (3 entries), ankle strain (3 entries), arm/elbow strain/tendinitis (3 entries) and neck sprain (2 entries). In terms of job categories, 12 (40%) of the 30 entries for MSDs were for strippers, including eight entries for shoulder/arm strains and four for low back pain. Only eight (21%) of the workforce at the WPD are strippers.

During the time period analyzed, the annual entries for MSDs were as follows: 1991--six entries; 1992--seven; 1993--six; 1994--six; 1995--four; 1996 (August 4)--one. The number of employees in the WPD was stable over this time period.

Medical interviews

Thirty-one of 38 workers (81%) from all three shifts of the WPD, agreed to participate in a confidential medical interview; 21 of these workers also answered a standard questionnaire during the second site-visit. The following results include information obtained from both the interviews and questionnaires. The interviewed group consisted of seven (23%) females and 24 (77%) males; the average age was 36 years (range 20 to 57). The average time of employment at the company was 8 years (range 1 to 31), and the average time at the department was 4 years (range 1 to 6).

Twenty-two workers (71%) reported at least one episode of work-related musculoskeletal symptoms within the previous year. These symptoms were reported by the workers to be job-related because the symptoms appeared after working in this workplace and were not related to previous injuries. Seventeen (55%) reported elbow/wrist/hand pain, 15 (48%) reported low back pain, 14 (45%) reported shoulder pain, 10 (32%) reported neck pain, and 7 (23%) reported foot pain. Nine (41%) of the 22 workers reporting MSDs symptoms stated that these started while working in other departments of the plant. Self-reported work-related symptoms by job title are shown in Appendix D.

The most commonly reported symptom involved the elbow/wrist/hand, followed by the low back and shoulder. Four (57%) of the linkers, four (50%) of the strippers, and six (55%) of the workers in the packaging area, reported elbow/wrist/hand MSDs symptoms. Most of the reports of back pain and shoulder pain were among the linkers and strippers. The strippers reported that their shoulder pain was related to hanging empty smokesticks above the oven and using the auxiliary racks. Some workers now working in the Packaging Area disclosed that their shoulder pain started while working in the "linking" or "stripper" areas.

Other concerns mentioned by the workers during the interviews included the following: the speed of the lines (12 workers); working on wet floors (4); racking while working in the unload operation (4); long distance of the south (far) linker to the smokehouse (3); tiredness and air quality concerns (2). The following suggestions for improving the workplace were made by the workers: replacing the plastic bags with coated boxes in the Packaging Area and introducing an adjustable height scale.

DISCUSSION

Ergonomic

Strain Index (SI)

According to the SI, which measures the risk for developing a distal upper extremity disorder, the jobs of concern were the loader, the unloader, and the scaler. Of these, only the loader exceeded the criteria describing a hazardous job. For the load job, classification in three of the risk factors used in the SI would be reduced if the need to carry the smokesticks to the oven was eliminated or reduced. The duration of the exertion would decrease, the speed of work would decrease, and the hand/wrist posture could improve. Walking to the oven carrying the smokestick tended to pull the worker's wrist into an extended posture which could be minimized or avoided if the wieners could be placed more directly into the oven. The resulting SI for a reduction in these three factors would be 4.5. Changes in the rotational or break pattern for the load job would not affect the SI unless the duration of the job exceeded four hours per day.

For the unload job, significant use of the auxiliary rack would increase the SI due to the increased frequency of handling the smokesticks. Placing the empty smokesticks on the hook conveyor is an added exertion for the unloader, but this aspect of the job was not evaluated using the SI because there is

currently no method for calculating a composite SI for jobs involving more than one type of exertion. The SI for the unload job is based only on the lifting of the smokesticks from the oven and delivering them to the stripper.

The main factors influencing the SI for the scaler job were the duration of the exertion and the speed of the operation. The duration of exertion was judged to be greater than 50% of the cycle because some type of manual exertion (albeit low force) was required during most of the work cycle. Less frequent removal of boxes from the line would reduce the SI for the scaler job. A change in work process that was under consideration at the time of the NIOSH visit, namely to substitute the plastic bags lining the finished product boxes with a wax coating, would reduce the exertion time and the repetitive motions and the non-neutral hand/wrist postures associated with folding the bag into the box. These changes could reduce the SI for the scaler job to about 3.

The SI calculations assuming the seasonal staffing changes resulted in no change in the scores. The net effect of the seasonal staffing is to increase the time that workers perform the manual aspects of their jobs. The SI is most sensitive to the duration of an **exertion** within the work cycle. The increases in time spent on the job associated with the seasonal staffing levels were not large enough to "bump" the jobs up into the next category of work duration. (see Appendix B). However, a change in work duration category due to the seasonal staffing almost occurred for the unload and stripping jobs in the Stripper area. The duration of work increased from about 2.8 hours per day per task to about 3.75 hours per task per day in this area. As seen in Appendix B, the break point to the next category for the SI occurs at >4 hours. If this were the case, the resulting SI scores for the stripping and unloading jobs would be 2.25 and 9, respectively, indicating a "hazardous" condition for the unload portion of the job.

In general, even though the SI is not sensitive to the minor increases in work duration represented by the seasonal staffing levels, increased work duration for a given task can be expected to increase the level of fatigue and risk of injury for a worker.

Finally, the SI score for the UMO job is likely not valid, because the index is designed for repetitive, stereotyped jobs, having fairly short cycles. The UMO job is better described as unstructured, having long periods of time between short duration bursts of activity.

Lifting Index (LI)

The LI's for the load and unload jobs were fairly low and similar to each other. For each lift, the factors which reduce the Recommended Weight Limit (RWL) were nearly ideal, meaning that very little could be achieved by modifying the geometry of the work station at the moment of lift off. The factor which most affects the LI is the horizontal location of the load from the body at the beginning of the lift (H). Even though the smokestick is long and a bit unwieldy, it can be held very close or in contact with the body, minimizing H. The worker does not have to stoop or twist while the lift is made, and the hand to load coupling is good. From a low back injury consideration, the most important factor contributing to the moderate risk of the lifting portions of these jobs is the work duration. Because the non-lifting period exceeds the lifting period for each of these jobs as a result of the rotation (2 times greater for the unload job and 3 times greater for the load job) these jobs are considered by the NLE to be short duration lifting. The following scenarios illustrate the importance providing adequate rest between periods of work in repetitive lifting tasks. For the work-rest periods described above for the load job, the frequency reduction factor was 0.84. Had the lifting period been between 1 and 2 hours before a break, the frequency factor would have been 0.72 (second duration category), and had it been between 2 and 8 hours, the reduction for frequency would be 0.45 (third duration category). The corresponding increases in the LI under these increased work durations would be to 1.5 and 2.6, respectively, for the load job. The LI would increase in a similar manner for the unload job assuming these hypothetical increases in work duration.

The seasonal staffing levels had the net result of classifying both the load and unload jobs in the second work duration category described by the NLE. This occurred because there were instances during the day in both jobs when periods of lifting were not followed by a non-lifting period equal to or greater than 1.2 times the lifting period. An increase in the LI from 1.3 to 1.5 for the load job and from 1.2 to 1.4 for the unload job may seem small, but both jobs had already exceeded the NIOSH recommendation of a LI = 1.0. Perhaps a more easily interpreted evaluation of the effect of going from the first to the second work duration category is that in doing so, the recommended weight limit (RWL) is reduced by over 14 percent.

Finally, lifting the empty smokesticks does not affect the LI for either the unload or load jobs under the seasonal staffing levels, as was also the case under the normal staffing levels.

A limitation of the NLE in characterizing the exposure to risk associated with these jobs was its inability to fully address the demands of the retrieval and hanging of the smokesticks. The equation does not allow a vertical height of more than 70 inches to be entered into a RWL calculation. Moreover, the equation is not designed to analyze lifts made with one hand, which was largely the manner in which the smokesticks were handled. However, it must be recognized that the handling of the unloaded smokesticks in both areas involves reaching overhead, handling an awkward object, and using one hand. If one considers that the NLE can be used as a design criterion, it can be concluded that the smokesticks are hung at a height which should be avoided. Another limitation of the NLE in evaluating the load and unload jobs is that it assumes a favorable ambient environment and good floor-to-shoe coupling. These jobs were performed in a cool environment and on wet floors, which are factors that would likely reduce the amount of weight that can be lifted safely.

Due to space limitations and the position of the unloader with respect to the oven, the most convenient location to hang the unloaded smokesticks in the Stripping area is above the oven. Retrieving the smokesticks from above the oven did not appear to be as much of a necessity in the Linker area. There is open wall space to the left of the oven that could accommodate a drop in the conveyor line height so that the stuffers could grab a smokestick without reaching overhead. The current arrangement is for the conveyor height to increase as it passes over the oven and exits the WPD.

The popular literature in ergonomics defines awkward or excessive shoulder flexion to be more than 45° from the midline of the body (Hagberg, 1982) or elbow above mid-torso height (Joseph, 1989). The height at which the worker should reach to hang the smokesticks, if they are at any time relocated, should be consistent with these generally accepted guidelines. Using anthropometric tables reflecting a 50-50 mix of males and females, these guidelines would suggest that the height of the hand at the moment the smokestick is hung on the conveyor line should be in the range of 43 inches (5th percentile) to 52 inches (95th percentile), average about 47.5 inches (Eastman Kodak, 1986).

Estimation of Energy Expenditure

Since the jobs in the packaging area were comprised mainly of supplementary activities, the metabolic estimates using the energy expenditure method may have overstated the actual amount of energy required by the jobs. This is less the case for the load and unload jobs, but for purposes of comparing the scores among jobs, it is more useful to regard the results as a “degree of difficulty” or “amount of effort” score. However, even though the supplementary activities do not necessarily involve more energy expenditure, they do add to physical or mental load, which causes fatigue and increased risk of injury. The jobs with the highest scores can be regarded as more demanding, but not as exceeding recommended energy expenditure levels, as comparison to the recommended criteria may seem to suggest.

Application of this job assessment method showed the same influence of duration of the working period

on effort rating or risk of injury that was seen with the lifting index. More points were scored for the task of carrying empty smokesticks from the conveyor to the linking machine than for carrying the filled smokesticks from the linker to the oven because the former activity takes place twice as often during the work day. This is due in part to the relatively wide ranges of weight in the same category of risk (11-40 pounds receive the same score) but, nonetheless illustrates the importance of recovery time in assessing the hazard associated with a job activity.

The effort score for the linker job (stuffer and carrier) could be reduced by 16 points if the load did not have to be carried to the oven. However, the metabolic estimation method is structured in such a way that the elimination of the need to carry the loaded smokestick would not affect the 22 points scored as the supplementary activity "standing/walking." If provision could be made for the stripper position to have the option of sitting so that throughout the day the three workers in the rotation stood less than 50% of the time, the score for the stripper/unload job would be reduced by 9 points.

For the scaler job, the metabolic effort score is somewhat exaggerated due to the 38 points assigned for lifting boxes off the line which should not have occurred as frequently as it was observed during the NIOSH evaluation. Under normal working conditions where product is flowing smoothly to the scaler and removing a box from the line due to improper weight is a rare occurrence, the score for the scaler job would be about 70. Even under the unusual conditions observed, the "whole department" rotation analysis scored this activity as 10 points because the scaler position would occupy each worker only 12.5% of the day if all eight performed it.

Using this method of evaluation, removing boxes from the line would not be scored if the duration of lifting was reduced to less than 5% (average of three minutes of lifting per hour). The score could be further reduced by 9 points if the need to fold the plastic bags into the box were eliminated.

The workers at the drop station, who mostly sat, were provided with adjustable chairs, but a wrench or pliers was needed to make changes in seat adjustment. The effort score could be reduced by 7 points if workers could easily adjust their chairs to achieve a comfortable seating position.

"Fixed external pace" was a supplementary activity common to all of the jobs evaluated in the WPD except the UMO, accounting for 13 points at each position.

The seasonal staffing levels did not have an appreciable effect on the metabolic scores, except for the loader job. This is due to the feature of the method whereby wide ranges of work duration receive the same score. In the case of the loader job, the primary activities of lifting and carrying took place for a duration precisely at the end of the "occasional" (5-25%) category. The changes in duration of these work tasks due to the seasonal staffing levels placed these primary activities in the "frequent" category of duration, resulting in 22 more points per activity.

Finally, the wide range in scores among jobs in the various areas suggest that there is opportunity for reducing the risk of injury for some workers through alternate or more wide range worker rotational schemes. This is illustrated in the analysis provided in the Packaging area where the effort score was 80, assuming that each of the eight workers spent an equal amount of time at each of the six work stations and ranging from 35 to 108 when workers rotated between the same job and a ½ hour utility/break position at 1½ hour intervals. More frequent use of the UMO position in the rotational scheme would reduce the external pacing requirement experienced by the other workers in the Packaging area. However, rotation through all of the positions does expose some workers to job stress factors not present in all jobs. Examples in the Packaging area are restrained seating at the drop stations, visual loads at the inspector and scaler positions, and lifting of boxes at the scaler position. A broader-based rotational pattern in the WPD would add lifting and carrying tasks to workers who perform mainly light

materials handling tasks, albeit at lower durations than workers currently performing those jobs. Because of the many tradeoffs in hazard exposures, the decision to rotate workers or modify any existing rotational scheme should be carefully considered.

Medical

The OSHA 200 log entries show a recent decline in 1996 for MSDs entries among workers at the WPD. Several reasons are possible for this decline including the following: 1) entries for 1996 were not for a complete calendar year; 2) seasonal staffing reductions and subsequent changes in the job pace had not taken place in 1996; 3) MSDs may be under reported by the employees; 4) increased WPD automation and/or job rotation changes may be helpful in reducing MSDs.

The methods used to evaluate the ergonomic hazards do not categorize jobs in the WPD as extremely hazardous. However, 71% of the interviewed workers in the department reported work-related musculoskeletal symptoms occurring within the previous year. Despite the fact that reported injuries on the OSHA 200 log have decreased in number, workers are self-reporting work-related MSDs symptoms while carrying on their daily work activities. Any changes that increase the physical effort required or the pace of the job may result in a higher incidence of injuries.

CONCLUSIONS

The following conclusions are based on the three methods used to evaluate the jobs in the WPD:

1. The load job in the Linker area and the unload job in the Stripping area are the most demanding jobs in the WPD. The risk of fatigue and/or injury is due more to carrying wieners than to lifting them, particularly in the Linker area where loads are carried considerable distances under conditions of cool temperatures and wet floors.

2. The jobs in the WPD are comprised of many job stress factors, but the normal worker rotation system reduces the level of these stress factors to the point of moderate hazard, and allows for adequate rest and recovery time in the jobs where more significant hazards are present.

3. Minor changes in staffing levels in the WPD can alter the equilibrium achieved by carefully selected work and non-work periods, which have been successful in moderating hazard to the workers.

4. Disruptions in the normal flow of product through the department can add to the work load in some positions. Examples include the double handling of loaded smokesticks in the Stripper area if the cooked wieners cannot be immediately delivered to the stripper, and unnecessary lifting and handling of boxes by the scaler if boxes are not properly filled at the drop stations.

5. The evaluation methods used were not able to fully characterize some of the work conditions and physical activities associated with the jobs in the WPD. The net result is a possible understating of the actual risk of injury to the workers while performing the jobs that were evaluated. Examples are the cool environmental temperatures, the wet floors, the handling of unloaded smokesticks in the Linking and Stripper areas, and the impulse force transmitted to the unloader when the smokestick is dropped onto the stripping table.

RECOMMENDATIONS

The following recommendations are offered to reduce the risk for development of occupationally-related musculoskeletal disorders of workers in the WPD:

Linker Area

1. Relocate the linking machines with respect to the smokehouse to reduce the distance that smokesticks loaded with wieners are carried for processing.

2. Reorient the conveyor in the Linker area so that the height drops to the level of the worker as it passes over the oven to eliminate overhead reaching while stuffers remove smokesticks.

   This modification is subject to facilities, product flow, and safety constraints. As stated in the Discussion Section, the optimal height is in the range of 43-52 inches.

3. Design lifting and non-lifting rotation patterns that are consistent with the "short duration" lifting category defined by the NLE.

Stripper Area

1. Provide a chair, sit/stand, or lean bar so that the stripper has an option other than standing while guiding wieners into the stripping machine.

2. Minimize the use of the auxiliary hanging rack that is used to store cooked wieners that can not be immediately delivered to the stripper position. Options include maintaining the smooth flow of product to the unloader as bottlenecks occur elsewhere in the department, or increasing the holding capacity of the stripping table to avoid use of the auxiliary rack. If the auxiliary rack must be used, adjusting the height of the rack to as close as possible to **30 inches** at lift-off is an option. This could be achieved by raising and lowering the lift as the rack is unloaded, but would be feasible only if no other hazards to the worker resulted.

3. Consider a softer material for the bottom of the bin on the stripping table to minimize impulse forces transmitted to the unloader. This option is feasible only if an appropriate material meeting quality and food purity specifications can be identified.

4. Design lifting and non-lifting rotation patterns that are consistent with the "short duration" lifting category defined by the NLE.

Packaging Area

1. Provide a chair with features of height, seat back, and foot rest adjustability for workers. A chair of this type is most feasible at the inspector and drop station positions, but should be provided to the scaler position operator if possible.

2. Substitute the plastic bag into which finished product is pre-packed with a box lined with an appropriate food grade material. This would eliminate the repetitive motions of the hand and wrist needed to fold the bag into the box. Considerations are product quality and purity and customer satisfaction.

3. Consider adding an adjustability feature to the scale to allow workers to select their preferred height. This would moderate the visual load and restrained head/neck posture requirements of the scaler.

4. Continue with rotational patterns currently in place within the area to moderate the risk of injury to the workers. This approach would be most effective if used in conjunction with reduction of the hazard at each individual work station to the extent possible, and using traditional staffing levels to achieve the optimum work-rest regimens.

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Appendix A
The Factors Comprising the NIOSH Revised Lifting Equation

A. Calculation for Recommended Weight Limit

RWL = LC * HM * VM * DM * AM * FM * CM
(* indicates multiplication.)

Recommended Weight Limit

Component	METRIC	U.S. CUSTOMARY
LC = Load Constant	23 kg	51 lbs
HM = Horizontal Multiplier	(25/H)	(10/H)
VM = Vertical Multiplier	(1-(.003|V-75|))	(1-(.0075|V-30|))
DM = Distance Multiplier	(.82+(4.5/D))	(.82+(1.8/D))
AM = Asymmetric Multiplier	(1-(.0032A))	(1-(.0032A))
FM = Frequency Multiplier	(from Table 1)	
CM = Coupling Multiplier		

Where:

H =Horizontal location of hands from midpoint between the ankles.
Measure at the origin and the destination of the lift (cm or in).

V =Vertical location of the hands from the floor.
Measure at the origin and destination of the lift (cm or in).

D =Vertical travel distance between the origin and the destination of the lift (cm or in).

A =Angle of asymmetry - angular displacement of the load from the sagittal plane.
Measure at the origin and destination of the lift (degrees).

F =Average frequency rate of lifting measured in lifts/min.
Duration is defined to be: $\leq$ 1 hour; $\leq$ 2 hours; or $\leq$ 8 hours
assuming appropriate recovery allowances

Appendix A Continued

Table 1
Frequency Multiplier (FM)
NIOSH Lifting Equation

Frequency Lifts/min	Work Duration					
	≤ 1 Hour		≤ 2 Hours		≤ 8 Hours	
	V < 75	V ≥ 75	V < 75	V ≥ 75	V < 75	V ≥ 75
0.2	1.00	1.00	.95	.95	.85	.85
0.5	.97	.97	.92	.92	.81	.81
1	.94	.94	.88	.88	.75	.75
2	.91	.91	.84	.84	.65	.65
3	.88	.88	.79	.79	.55	.55
4	.84	.84	.72	.72	.45	.45
5	.80	.80	.60	.60	.35	.35
6	.75	.75	.50	.50	.27	.27
7	.70	.70	.42	.42	.22	.22
8	.60	.60	.35	.35	.18	.18
9	.52	.52	.30	.30	.00	.15
10	.45	.45	.26	.26	.00	.13
11	.41	.41	.00	.23	.00	.00
12	.37	.37	.00	.21	.00	.00
13	.00	.34	.00	.00	.00	.00
14	.00	.31	.00	.00	.00	.00
15	.00	.28	.00	.00	.00	.00
>15	.00	.00	.00	.00	.00	.00

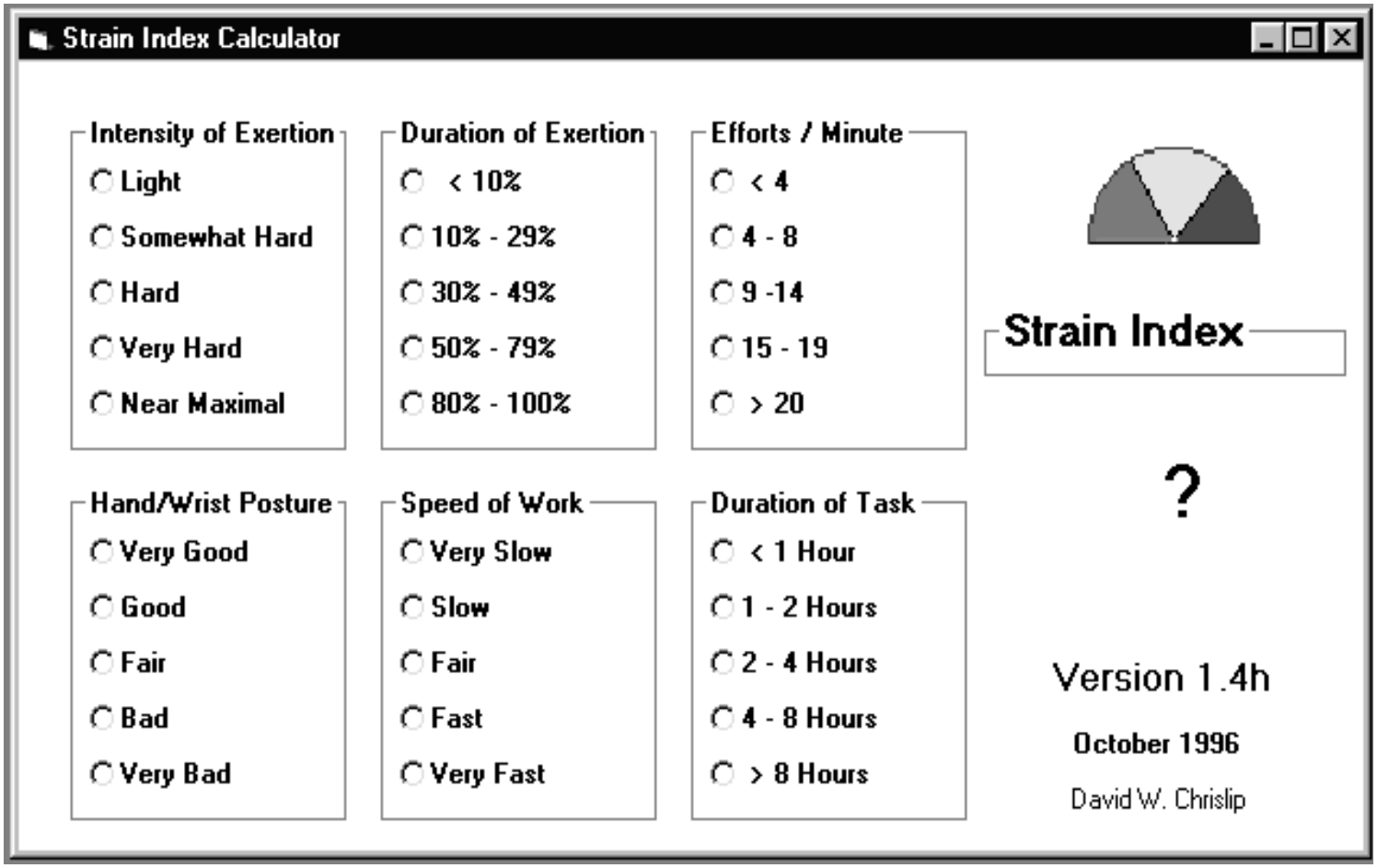
†Values of V are in cm; 75 cm = 30 in.

Appendix A Continued

Table 2
Coupling Multiplier
NIOSH Lifting Equation

Couplings	V< 75 cm (30 in)	V ≥ 75 cm (30 in)
	Coupling Multipliers	
Good	1.00	1.00
Fair	0.95	1.00
Poor	0.90	0.90

Appendix B
The Factors Comprising the Strain Index



Appendix C
The Primary and Supplementary Activities that Comprise the Metabolic Energy Estimation

Energy Estimation Score Tables

A. Primary Physical Effort Requirements

	Light		Moderate		Heavy	
Type of Effort	**Weight of Force**	**Ease of Handling**	**Weight or Force**	**Ease of Handling**	**Weight or Force**	**Ease of Handling**
Lift/Carry (weight)	1.8-4.5 kg (4-10 l bm)	Easy/Difficult	5-34 kg (11-75 lbm) 5-18 kg (11-40 lbm)	Easy Difficult	>34kg (75 lbm) >18 kg (>40 lbm)	Easy Difficult
Application of Forces (force)	18-180 N (4-40 lbf) 18-110 N (4-25 lbf)	Easy Difficult	181-335 N (>40-75 lbf) 111-180 N (>25-40 lbf)	Easy Difficult	>335 N (>75 lbf) >180 N (>40 lbf)	Easy Difficult
Climbing (weight)	0-4.5 kg (0-10 lbm)	Easy/Difficult	5-18 kg (11-40 lbm) 5-11 kg (11-25 lbm)	Easy Difficult	>18 kg >40 lbm) >11 kg (>25 lbm)	Easy Difficult

Scoring for Primary Physical Effort

Degree of Effort

	Light	Moderate	Heavy
Duration Occasional 5-25%	10	16	26
Frequent 26-50%	19	38	57
Constant >50%	38	76	115

Appendix C Continued

B. Supplementary Physical Effort Requirements

Type of Effort	Low	Medium	High
Standing/walking	------	25-50% of time	>50% of time
Restrained posture (except neck and head)	Sit >75% of time	Awkward posture >5% of time	--
Visual or auditory requirements >50% of time; restricted head and neck posture (RHN)	Easily detected, no RHN	Easily detected, with RHN; Hard to detect, no RHN	Hard to detect, with RHN
Fixed External Pace	-----	> 50% of time	-----
Use of small muscle groups (fingers, hands, forearms, feet), up to 1.8 kg (4 lbm)	-----	25-50% of time	>50% of time
Short-duration heavy effort (< 5% of time)	----	Up to 23 kg (50 lbm)	> 23 kg (> 50 lbm)

Scoring for Supplementary Requirements

Level of Effort	Points
Low	6
Medium	13
High	22

Appendix D

Distribution of Self-reported Work-related Musculoskeletal Symptoms Among Workers at the WPD by Job Title Oscar Mayer Foods - Madison, WI

	Linkers (n=7)	Strippers (n=8)	Packaging (n=13)	Other Job Title (n=3)	Total
Elbow/wrist/hand	4	4	7	2	17
Low back	5	3	5	2	15
Shoulder	4	4	5	1	14
Neck	2	0	6	2	10
Foot	4	1	0	2	7