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16. Abstract (Limit: 200 words) This testimony concerned NIOSH research on carpal tunnel syndrome as an occupational disorder. The name, carpal tunnel, derives from the 8 bones in the wrist called carpals which form a tunnel like structure. The tunnel contains tendons which control finger movement and provide a pathway for the median nerve to reach sensory cells in the hand. Nerve compression results from various conditions. Repeated flexing and extension of the wrist causes the tendons to swell and thereby increases pressure in the bony tunnel which can pinch or trap the median nerve. Job tasks which involve highly repetitive manual acts or necessitate wrist bending or other stressful wrist postures, are connected with incidents of carpal tunnel syndrome or related problems. Patients suffering from this syndrome lack the ability to sense cold or hot by touch and experience an apparent loss of strength in their fingers. Treatment may involve surgery or the use of antiinflammatory drugs. However, success in treatment has been limited. Jobs which have been identified as causing carpal tunnel syndrome have included the assembly of small parts and the manual inspection of manufactured products. Control measures focus on relieving excessive wrist deviations and arm and hand movements requiring force. Some tools have been redesigned. Other recommendations include the modification of work stations and the use of fixtures to mount work at angles and reduce the need for the worker's hand to bend at the wrist. NIOSH studies of postal worker jobs and letter sorting machine operations were described.

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CONGRESSIONAL TESTIMONY

TESTIMONY OF

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

before the

SUBCOMMITTEE ON POSTAL PERSONNEL AND MODERNIZATION

COMMITTEE ON POST OFFICE AND CIVIL SERVICE

U.S. HOUSE OF REPRESENTATIVES

June 8, 1984

Mr. Chairman, Congressman Mitchell and Members of the Subcommittee:

I am Barry Johnson, Ph.D., Director, Division of Biomedical and Behavioral Science in the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control. With me is Dr. Michael Smith, who directs the Division's research on job stress and related health issues; his activities have included studies of postal worker jobs, including machine-paced letter sorting operations. We are pleased to describe NIOSH's research on carpal tunnel syndrome as an occupational disorder.

The carpal tunnel receives its name from the 8 bones in the wrist, called carpals, that form a tunnel-like structure. This tunnel is filled with tendons which control finger movement; it also provides a pathway for the median nerve to reach sensory cells in the hand. It is well documented that compression on the median nerve in the wrist will result in sensory and motor dysfunctions in the hand. Nerve compression can result from a host of conditions including wrist fractures, tumors, rheumatoid arthritis and diabetes mellitus. In the mid 1960's researchers began to observe an association between wrist disorders and the performance of certain repetitive manual tasks. Regardless of whether the cause is occupationally-based or arises from non-occupational sources, it has been established that repetitive flexing and extension of the wrist cause the tendons to swell and thereby increase pressure in the bony tunnel. This, in turn, can trap or pinch the median nerve. Blockage of this nerve can cause loss of touch in certain

surface areas of the hand and produce numbness, pain and tingling in the thumb, index and ring fingers. When this condition is detected, it is labeled as carpal tunnel syndrome.

This syndrome has several adverse consequences. Many patients with carpal tunnel are unable to differentiate hot from cold by touch, and experience an apparent loss of strength in their fingers. They appear clumsy in that they have trouble performing simple tasks such as tying their shoes or picking up small objects. Treatment of carpal tunnel syndrome may involve surgery to release the compression on the median nerve and/or use of anti-inflammatory drugs to reduce tendon swelling in the carpal tunnel. Such medical interventions have met with mixed success.

In the past ten years, more and more cases of workers afflicted with carpal tunnel syndrome have been reported in the medical literature. One reason for this increase may be that automation and job specialization have fragmented workers' tasks to the point where a given job may involve only a few manipulations performed thousands of times per workday. Examples of these kinds of jobs are the assembly of small parts and the manual inspection of manufactured products. The increased awareness of work tasks as a factor in the onset of carpal tunnel syndrome is reflected in the growing number of requests for health hazard evaluations (HHEs) received by NIOSH to investigate such suspected problems. These requests originate about equally from the employers and workers, and, in some cases, are submitted jointly. Between 1976 and 1983, NIOSH received 20 HHE requests related to carpal tunnel syndrome. Thus far, in 1984 six more have been received. The attached table lists 19 HHE requests investigated through 1983.

In many cases, clinical evidence of carpal tunnel syndrome has been the impetus for requesting a NIOSH HHE; that is, documentation of surgery or medical intervention was required for one or more workers performing certain jobs suspected of causing the problem. This is seen in the table, which provides summary information about the types of jobs, reported number of wrist problems, and documented cases of carpal tunnel syndrome for the requests investigated to date. For example, item 1 in the HHE list shows that in a film and paper packaging plant, 104 workers reported wrist problems, either before or at the time the HHE request was submitted to NIOSH. Moreover, 8 of the 104 symptomatic workers were diagnosed by physicians as having carpal tunnel syndrome and received some form of treatment, including surgery. Of nineteen worksite evaluations listed in the table, twelve found employees who had been diagnosed and treated for carpal tunnel syndrome by physicians. With regard to postal work, NIOSH records indicate eleven requests from U.S. Postal centers to evaluate a variety of workplace problems. All eleven were concerned with postal workers' exposure to chemicals, and none of these was related to carpal tunnel syndrome.

NIOSH HHEs indicate that job tasks involving highly repetitive manual acts, or necessitating wrist bending or other stressful wrist postures, are connected with incidents of carpal tunnel syndrome or related problems. Moreover, it is apparent that this hazard is not confined to a single industry or job but occurs in many occupations - especially those in the manufacturing sector. Indeed, jobs involving cutting, small parts assembly, finishing, sewing, and cleaning, seem predominantly associated with the syndrome. The factor common in these jobs is the repetitive use of small hand tools.

Consistent with the above observations, NIOSH recommendations for controlling carpal tunnel syndrome have focused on ways to relieve excessive wrist deviations and arm and hand movements requiring force. Some of our recommendations involve redesign of tools or tool handles, to enable the user's wrist to maintain a more natural position and to ensure better distribution of grip forces during work. Other recommendations have involved modified layouts of work stations and the use of fixtures to mount work at angles and reduce the worker's need to bend the wrist. Still other remedial approaches include altering the existing method for performing the job task, providing for more frequent rest breaks, and rotating of workers across jobs. Tool and processes redesign are preferable to administrative means, such as job rotation, as a first means of prevention.

In addition to responding to HHE requests from employees or employers to evaluate problems of carpal tunnel syndrome, NIOSH has underway a program to develop a data base for rating risk factors which produce carpal tunnel syndrome and other wrist disorders. One study involves 108 jobs across 9 occupations to determine the influence of repetitiveness, amount of muscle force, extent of wrist deviation, and vibration level in the etiology of wrist disorders. If the results from this study permit, we will recommend critical limits for these job task conditions in order to prevent carpal tunnel syndrome and other disorders of the wrist.

The NIOSH studies of postal worker jobs and letter sorting machine operations were an outgrowth of a larger project involving the stress and health consequences of machine-paced (vs. self-paced) job demands. Other groups of workers who perform machine-paced work were also studied in this project. The

thrust of these studies was not directed to carpal tunnel syndrome or musculoskeletal problems per se, but rather to an array of potential health strains in the groups of workers surveyed.

NIOSH research with letter sorting machine (LSM) operators in the postal service has involved two efforts. The first was to support a research contract at the University of Wisconsin to evaluate on a longitudinal basis the health effects on workers from the use of LSMs. This was a 5-year effort in which approximately 50 newly hired LSM operators at the Madison, Wisconsin, postal facility were examined each year for any medical and psychological disturbances associated with their jobs. This study was directed by Dr. Robert Arndt, Department of Preventive Medicine, at the University of Wisconsin and a final report is expected later this year.

The second effort was a NIOSH questionnaire survey of over 12,000 postal employees, including LSM operators, to determine their physical and emotional health complaints, and as such was not limited to carpal tunnel syndrome. This survey also examined job satisfaction and job demands. Responses were received from over 6,400 postal employees. This number includes approximately 3,400 LSM operators. Findings for the LSM operators were compared with those for manual distribution clerks, who sort mail by hand, to determine the effects of the paced work operations on self-reported health complaints. The LSM operators reported more complaints related to arm, wrist, hand and finger problems than did manual distribution clerks of comparable age. Specific complaints included stiff or sore wrists, loss of feeling in the fingers or wrists, loss of strength in arms or hands, and finger cramps when working. Differences between LSM operators and the distribution clerks in percentages of workers reporting such complaints ranged from 5% to 18%.

The LSM operators responding to our questionnaire reported higher levels of health complaints related to hand and wrist problems than did manual distribution clerks. The most likely job factors that account for the difference in the increased incidence of hand and wrist problems are the keying demands and perhaps the sitting requirements of the machine operators. An interim report of this study was provided in 1983 to the U.S. Postal Service and the Postal Workers Union for review and comment. Based on comments from both groups, we have undertaken additional analyses of our data. NIOSH is now in the process of completing a technical report covering all phases of the questionnaire survey study. When that report is completed, at the end of the fiscal year, we would be pleased to provide a copy to the Subcommittee.

We would be pleased to answer any questions that the Subcommittee members might have regarding this testimony.

Summary of HHEs Related to Carpal Tunnel Syndrome

INDUSTRY/JOB TYPE	SELF-REPORTED RATE OF WRIST PROBLEMS	NUMBER OF CARPAL TUNNEL CASES DOCUMENTED BY PHYSICIANS
1. Film and Paper Packaging	104	8
2. Tableware Manufacture	37	1
3. Grocery Warehouse	unknown	unknown
4. Laminated Plastics Products	19	unknown
5. Combustion Exhaust Systems (Metal Chimneys)	33	6
6. Trimmings/Finishing Fiberglass Typewriter Housings	15	7
7. Electrical Extension Cord Manufacturer	56	1
8. Manufacturer of Air Filters	18	18
9. Manufacture of Electric Generators	38	6
10. Manufacture of Grease Guns and Bottle Jacks	19	8
11. Manufacture of Wholesale Food Products	41	12
12. Manufacture of Plumbing Fixtures (toilets)	4	-
13. Manufacture of Catalytic Converters	36	9
14. Manufacturer of Ammunition Propelling Charges	11	unknown

15. Work Wear Garment Manufacture	32	7
16. Fish Fillet Plant	38	unknown
17. Publishing Company/Bindery	23	unknown
18. Publishing Company/Bindery	13	11
19. Small Engine Manufacture	198	unknown