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Hand-Arm Vibration Exposure Trends among the Workforce in Sweden †

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Abstract: The aim of this research was to study hand-arm vibration (HAV) exposure trends in the workforce in Sweden by using a Job-Exposure matrix (JEM). All individuals employed during 1980 and 2010 with an occupational code were included. The daily eight-hour equivalent HAV exposure values were divided into three exposure categories. During the study period, the proportion of workers exposed above the action value had decreased, as well as the proportion of workers exposed to any HAV. In 2010, 4% of the workforce in Sweden were exposed to HAV above the action value.

Keywords: hand-arm vibration; job-exposure matrix trend; workforce

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1. Introduction

Hand-arm vibration (HAV) is common among construction, industry, forestry, and manufacturing workers. HAV could cause vascular, neurological, and musculoskeletal injuries over time [1]. It is therefore important to decrease the exposure levels. To study changes in HAV exposure over time, a Job-Exposure matrix was constructed for the Swedish workforce. The JEM consisted of the eight-hour equivalent HAV exposure connected to each occupational code. More participants could be included by using a JEM, and it could be used to study trends regarding the workforce. The aim of this paper was to study trends of HAV exposure from 1980 to 2010.

2. Materials and Methods

A worker was included if they were above 18 years old, employed for one year in the Swedish workforce during the study period of 1980–2010, and had a occupation with an occupational code. Information on age was gathered from the Register on the Entire Population (Registret över totalbefolkningen) at Statistics Sweden. Information on employment and job title among the Swedish workforce was gathered from FOB 1980 and 1990 and SSYK-96. Every occupation in Sweden is coded according to the occupational classifications of the National Labour Market Board (Arbetsmarknadsstyrelsens yrkesklassificering). The occupational classification code is based on the International Standard Classification of Occupations, ISCO-88-code system, and has been described elsewhere [2]. The FOB80 classification was used for exposures between 1980 and 1990, and SSYK96 was used for 2001–2013 with four-digit codes. The eight-hour equivalent HAV exposure level, A(8), was calculated for each occupational code and for each job classification system. The A(8) was calculated according to the present international standard ISO 5349-1. The HAV levels were based on earlier measurements from scientific articles, measurement reports, and vibration databases (n = 90). The exposure categories for the A(8) value were low (range: above 0 to <=1 m/s^2), moderate (range: above 1 to <2.5 m/s^2), and high (range: =>2.5). HAV

exposure in the high group was set according to exposure above the action value from the EU directive on vibration [3].

3. Results

During the period 1980–2010, the proportion of workers exposed to high HAV levels decreased (Table 1). From 1980 to 2010, the proportion of workers in the low and moderate HAV exposed groups also decreased. In 2010, the proportion of workers with any HAV exposure decreased from 29% to 19%.

Table 1. Proportion of workers with daily equivalent hand-arm vibration exposure (low (range: above 0 to <=1 m/s^2), moderate (range: above 1 to <2.5 m/s^2), and high (range: =>2.5)) from 1980 to 2010.

HAV	1980	1990	2001	2010
Low	12	11	10	10
Moderate	7	6	5	5
High	10	8	4	4
All	29	25	19	19

4. Discussion

The proportion of workers exposed to high HAV levels in Sweden declined during the study period. During this time, an EU directive was implemented to reduce workers' exposure to HAV [3]. Some machines have better designs to reduce the vibration levels. Additionally, there are less workers in occupations in which they use hand-held vibrating tools, since manufacturing declined in Sweden during the study period.

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Informed Consent Statement: Subject consent was waived due to use of Swedish public register data which allow universities in Sweden to conduct their own evaluations regarding consent and the use of data without consent if it will benefit the citizens.

Data Availability Statement: Information and data from the Job-Exposure matrix used will be available from February 2023 on the Karolinska Institutet homepage.

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