

NIOSH Pursues Hand-Vibration Studies to Understand, Address Risks

As far back as 1911, scientists associated vibration from hand-held tools with the risk of pain, numbing, and blanching of the fingers, known as vibration white finger. Although limited progress has been made in reducing this risk over the years, many key aspects of the problem still are not well understood, hampering further efforts to identify worker populations at risk, and to design effective control measures.

The National Institute for Occupational Safety and Health (NIOSH) is pursuing studies to help fill those critical gaps and point to ways for effectively reducing risks of hand-vibration disorders for employees who use jackhammers, chipping hammers, power drills, and other vibrating tools. Individually, the studies focus on particularly complex, challenging areas where new data will further advance the understanding and prevention of job-related hand-vibration disorders. Collectively, the studies constitute a balanced, interlocking program of strategic research.

The studies will give scientists better insight into the factors that link occupational exposures to vibration with given physiological outcomes: How is the energy from a vibrating handle transmitted into the hand and arm? What effects result? By combining this better understanding of physiological health effects with epidemiological data showing trends in the occurrence of cases, scientists will have greater ability to predict types of occupations, work activities, and work settings that may pose the greatest risk of hand-arm vibration disorders. Current projects at NIOSH include these:

- Using advanced microscope technologies to determine if adverse effects from vibrating tools can be predicted from physical changes in the capillaries at the base of the fingernail cuticle, too small to see with the naked eye.
- Developing a computer model of stress and strain on the fingertips from vibrating tool handles, as measured by the degree to which the soft tissues of the fingertips are compressed or displaced by the vibrating handle, as another potential way to flag early warning of adverse effects.
- Assessing infrared thermal imaging of the hands as a potential method for identifying the presence and severity of hand-arm vibration syndrome, based on previous research showing that the temperature of the fingertips – after exposure to cold – returns to normal more slowly in a person with hand-arm vibration syndrome than in a person without that condition.
- Designing a test method for simultaneously measuring the impact of a chipping hammer bit and the degree of vibration from the handle; the method would give scientists a way to determine if control measures effectively minimize vibration without diminishing the chipping hammer's performance.
- Investigating the effectiveness of anti-vibration gloves through tests using an instrumented vibrating handle that simulates specific tools and vibration characteristics.

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