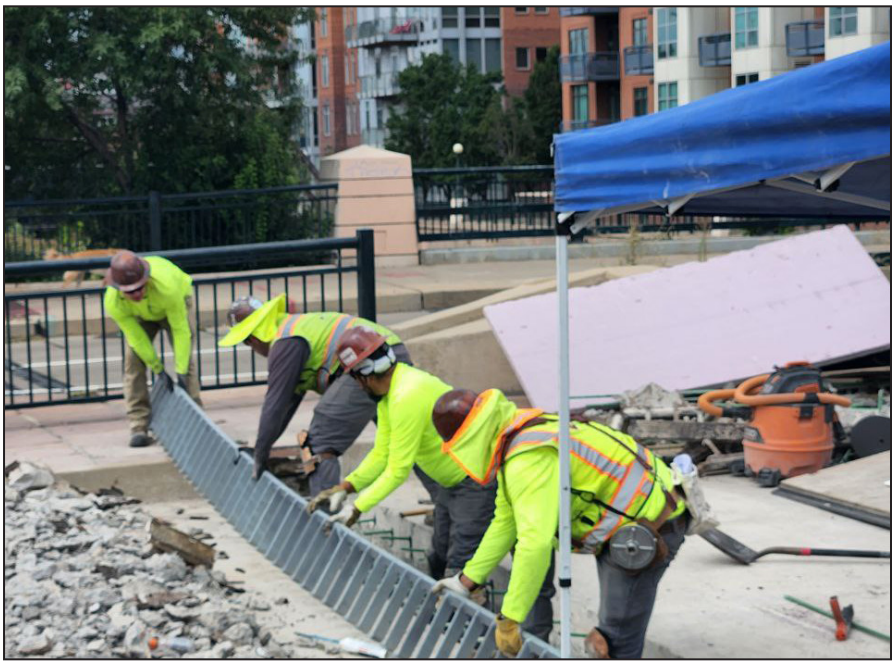
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 24-520 (project 649) | March 2024

Assessment of Safe Work Indicators in Transportation Construction Using Personal Monitoring Systems



the ISSUE

Construction projects require long hours where workers are subjected to intensive tasks such as hard manual labor, heavy lifting, and compulsive working postures. Among the physiological metrics, heart rate (HR) is considered a good indicator of physical stress and workload. However, there are no reported studies on HR modeling and forecasting in the construction field.

the RESEARCH

The objective of this study was to (1) analyze the effect of physiological factors, including breathing rate, acceleration of torso movements, torso posture, and impulse load, on the HR of construction workers; and (2) model and forecast one-minute ahead HR for construction workers based on their physical activity using deep learning algorithms. To this end, physiological metrics of five bridge maintenance workers performing several construction activities were collected.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

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North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

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Project Title

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the **FINDINGS**

The primary contribution of the research is to apply a piloted method developed by the contributing researchers that facilitates comparison of discrete physiological metrics across individuals performing a range of construction activities. This information will be valuable to managers in deciding how to schedule transportation construction workers to maximize both productivity and health, and in establishing indicators and real-time warning systems to prevent undue worker physical stress, with a focus on particular activities and extreme weather conditions.

the **IMPACT**

Models based on this work have the potential to facilitate the mitigation of cardiovascular strain and enable ongoing prevention of accidents in the construction industry. The research will also establish benchmarks for transportation construction workers' physiological health and performance and written "best practice" guidelines for conducting physical construction activities while constructing physical infrastructure projects.

For more information on this project, download the Main report at https://www.ugpti.org/resources/reports/details.php?id=1164

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.