

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 21-432 (project 605) | March 2021

Validation of AlertMeter® Fatigue Assessment Device for Transportation Workers



the ISSUE

Fatigue is believed to be a major factor contributing to workplace safety, leading to accidents, injuries, and decreased production efficiency. A recent publication from the National Highway Traffic Safety Administration estimates that from 2% to 20% of annual traffic deaths are attributable to driver drowsiness. From 2009 to 2013, there was an annual average of more than 72,000 police-reported crashes involving drowsy drivers, injuring an estimated 41,000-plus people and killing more than 800. Fatigue is also a concern for commercial vehicle operations, railroads, and industry. Although there have been improvements in fatigue detection devices, most of those devices are not practical for use in the workplace or field. The need for a more portable or smartphone-based app to measure fatigue in transportation operations is apparent.

the RESEARCH

Data were collected from a sample of healthy adults over a 36-hour period of wakefulness. Participants completed the AlertMeter® (a commercially available electronic vigilance test that can assess fatigue/vigilance within two minutes) and psychomotor vigilance tests (PVT) (a widely used laptop-based standard reaction time performance measure) multiple times to establish a baseline. They were asked to wear a Fitbit and record their sleep patterns using the Denver Sleep Log (DSL) for five days leading up to the 36-hour extended wakefulness period. At 9 a.m. Friday, the participants checked into a hotel, and for the next 36 hours at two-hour intervals they were assessed on the AlertMeter via tablets and their smart phones. They also completed the PVT on their portable tablets. Working memory was assessed at three time points: (a) 1 hour of wakefulness, (b) 17 hours of wakefulness, and (c) 34



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Colorado State University
North Dakota State University
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Project Title

Validation of Smartphone
AlertMeter® Fatigue
Assessment Device for
Transportation Workers

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Predictive Safety, Inc.

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Innovative Technology
Administration

the RESEARCH cont.

hours of wakefulness. Participants were provided meals and snacks without caffeine and limited sugars. They were able to play games in the room, take monitored walks, and watch television. They were not permitted to use any stimulants. During the wakefulness phase of the study, research assistants monitored the participants. At the end of the 36 hours, participants were given a room at the hotel to sleep for at least eight hours.

the FINDINGS

The AlertMeter was found to be significantly correlated with the PVT, the gold-standard for the measurement of fatigue, as well as subjective measures of alertness and fatigue from the Karolinska Sleepiness Scale, all of which showed decrements over time in association with increased amounts of wakefulness. The results of the study demonstrate the concurrent validity of the AlertMeter with the PVT as a measure of fatigue and alertness. Moreover, reaction time measured with the AlertMeter varied as expected with increased amounts of wakefulness in accordance with expected circadian patterns, further supporting the validity of the AlertMeter as a measure of alertness and fatigue. Findings were inconclusive with respect to the memory assessment.

the IMPACT

This research demonstrates that the Alertmeter is a valid measure of fatigue. Using the Alertmeter in operational transportation settings will increase the likelihood that driver operators will begin work at an optimal level of alertness, thereby reducing the risk of drowsy driving, traffic or rule violations, and crashes. Further adoption of the Alertmeter in the operational setting will contribute to a greater degree of safety in the U.S. transportation system.

For more information on this project, download the entire report at <https://www.ugpti.org/resources/reports/details.php?id=1037>

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.



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