SUMMARY / NOTES

University of Pittsburgh: Effects of In-Wheel Suspension on Whole-Body Vibration and Comfort in Manual Wheelchair Users.

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This is a completely independently-funded, rigorous, peer-reviewed study conducted by the University of Pittsburgh - a world-leading research institute into wheelchairs and wheelchair users.

The researchers found that Loopwheels are effective at reducing both vibration and shock for manual wheelchair users, which is important because frequent and prolonged exposure to high levels of vibration and shock can cause neck and back pain and discomfort.

The study shows that even at low speeds, Loopwheels reduce vibration and shock for wheelchair users and enables use of a wheelchair for about an hour longer every day without hitting hazardous levels of vibration.

First report from this study: there is more to follow

This paper analyses and reports just on the first phase of the testing of a bigger study carried out by the University of Pittsburgh.

We understand from the researchers that a further two papers will be submitted for peer-reviewed publication in the coming year, which will explore the results of the later parts of this study, in which participants used the three different types of wheels for three months and kept a "pain diary" over that time.

These findings add to the body of knowledge about the benefits of Loopwheels for wheelchair-users. This study looked at slow-speed, manual use over 9 different surfaces. Our own work previously has measured vibration reduction by Loopwheels at faster speeds, using a power attachment that lifts the wheelchair casters off the ground, and so higher levels of vibration reduction were experienced in our testing than in this study.

What is Whole Body Vibration and why do we care?

Whole Body Vibration (WBV) is typically characterised by both low impact, long-term vibrations and high impact, short-term shocks (eg driving over a gravel road vs hitting a pothole on a smooth road, respectively). Many previous studies over many years have shown that too much exposure of the human body to whole body vibration can be detrimental to health. Given the risk of health consequences associated with WBV, the International Standards Organisation (ISO) has published several guidelines on levels of vibration exposure and their relationship to health outcomes, specifically ISO 2631 defines WBV exposure from a seated position.

What does this part of the Pittsburgh study show?

Loopwheels were compared with standard spoked wheels and with Spinergy CLX wheels and were tested by live participants manually propelling (at slow speed) over 9 different surface types.

The main conclusions are:

- frequent and prolonged exposure to high levels of vibration and shock can cause neck and back pain and discomfort for many wheelchair users (this is already known).
- Loopwheels are effective at reducing both vibration and shock
- The other two types of wheels were not effective at reducing vibration or shock.

Specifically, the results show that:

- Loopwheels significantly reduced the amount of Whole Body Vibration exposure at the backrest and at the footrest
- Loopwheels lowered vibrations by 10% at the backrest compared to the standard and CLX wheels and by 7% at the footrest compared to the CLX
- Loopwheels also reduced shocks by 7% at the backrest compared to the standard wheel and CLX.
- Assuming a Manual Wheelchair User occupies their wheelchair for an average of 13 hours a day, a 7-10% reduction in backrest and footrest vibration would reduce the amount of exposure to harmful Whole Body Vibration by around an hour, and potentially increase the amount of time a manual wheelchair user can safely push before it becomes it becomes hazardous to health.
- Despite the extra weight of the Loopwheels, there was no adverse effect on comfort scores and Loopwheels trended higher in comfort scores than the other two wheels tested.
- Further study involving long-term testing is required to determine effects on health. (Note: *We at Loopwheels hope that the rest of the study by Pittsburgh may start to show this, but we don't know any results yet).*

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You can read the full academic paper in the Journal *Vibration* here: https://www.mdpi.com/2571-631X/7/2/23

We will share any further papers from this study as and when they are published.