



**Netti**<sup>®</sup>  
BY ALU REHAB

A smoother  
and more  
comfortable  
ride

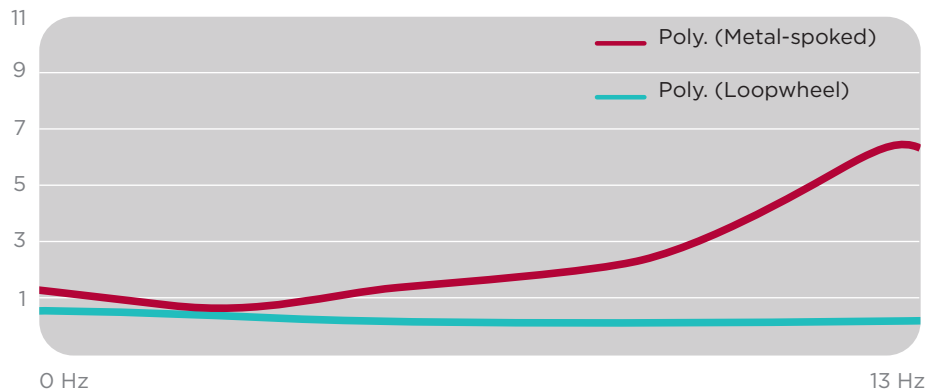
A vibration reducing wheel  
with integral suspension

# Go more places - more comfortably

A wheelchair is a great aid to increase mobility, but when you're on uneven ground, vibrations can wear you out, making it harder to drive your chair and triggering spasms and pain. Loopwheels make travelling fast over bumpy ground more fun and less tiring.

Revolutionary Loopwheels have been specially designed to help wheelchair users get around more easily and with more comfort. The springs give you extra power to get up kerbs, and reduce jolting as you come down. This gives a much smoother ride than standard wheels, wherever you go.

## Up to 70% less vibration



A Nov 17 test showed that Loopwheels reduced transferred vibration **by 76%** at 15hz and **68%** at 7Hz over a standard spoked wheel.



Loopwheels give a smoother ride on bumpy, uneven ground such as woodland tracks, cobbles, grass and beach as well as smoother surfaces like paths around town.

Less effort is needed to push over uneven pavements, cobbles, grass and gravel paths and it's easier to get up kerbs too.

Loopwheels can be used with your Netti 4U CE Plus, Netti 4U CED, Netti III or Netti III HD wheelchair to make the ride even more comfortable.



## LOOPWHEELS CLASSICS

# Be more comfortable

“Potholes, cracks, cobbles – when you have chronic pain, you feel every vibration like a knife. Loopwheels took only a second to fit. They definitely reduce the pain of going over bumps, kerbs and cobbles and have made every trip out far more comfortable.”

Libby Parfitt  
Complex Regional Pain Syndrome sufferer

## User groups

Loopwheels help alleviating e.g. lower back pain, spasms and fatigue.



- Users with involuntary movements or cerebral palsy (CP) often experiences a reduction in symptoms. The involuntary movement is not “triggered” as frequent and the user can thereby use the wheelchair for longer periods and travel longer distances without experiencing pain of getting exhausted.
- Users suffering from e.g. fibromyalgia or multiple system atrophy (MSA) or any pain disorder can experience a reduction in discomfort and thus increase mobility.
- Users with neurological diseases like e.g. MS, ALS, Parkinson’s may experience less symptoms since the vibration to the body is less.
- Users with organ dysfunctions like bladder- or bowel dysfunctions. The reduced vibration can make it easier to control the function of the organs.
- For users with Muscular dystrophy (DMD) or minimal core muscles such as e.g. paraplegics or Spinal Muscular Atrophy (SMA) Loopwheels can achieve relief and protection of the intervertebral discs and internal organs. As an addition, the mobility of the user can be increased.
- Whole-body vibrations are a significant risk factor for people with spinal injuries. These can lead to increased muscle fatigue and damage nerve tracts. Loopwheels can help protect the body.
- Loopwheels can also help protect the body by users suffering from Osteogenesis Imperfecta (OI) giving the users more safety and mobility.

## Go more places

“What amazed me about Loopwheels is what an unbelievable confidence boost they gave me. They made it so much easier to get over uneven ground, and made me feel so much happier about getting out and about with my friends and family after my accident.”

Ian Maskell  
Injured in a cycling accident in 2013



## LOOPWHEELS CLASSICS

# How Loopwheels work

A Loopwheel is a wheel with integral suspension, designed to reduce vibration and increase performance and provide greater comfort. Loopwheels give you a smoother ride. They are more comfortable than standard wheels: the carbon springs absorb tiring vibration, as well as bumps and shocks. They're designed for everyday use and are strong and durable. They don't run as true as a spoked wheel, and you'll notice more sideways movement, but they're a lot more comfortable and contribute to better health.

### A new feeling

You'll notice your loopwheel has more movement, vertically and laterally. As soon as the springs are loaded, they compress and further change their concentricity. This is what gives your wheelchair comfort and shock absorption. A Loopwheel is designed to absorb shocks, reduce jolting and cushion your body against vibration. You'll notice more sideways movement than with a spoked wheel, but you're trading rigidity for greater comfort.

When you have spent your whole life with rigid spoked wheels, they may seem strange to you at first.

Loopwheel springs are made from a carbon composite material, carefully developed and tested to give optimum compression and lateral stability as well as strength and durability. Specially-designed connectors attach the springs to the hub and rim.

The three loops in each wheel work together as a self-correcting system. This spring system between the hub and the rim of the wheel provides suspension that constantly adjusts to uneven terrain, cushioning the rider from bumps and potholes in the road. In effect, the hub floats within the rim, adjusting constantly as shocks from an uneven road hit the rim of the wheel.

The spring configuration allows the torque to be transferred smoothly between the hub and the rim.

### PRODUCT SPECIFICATIONS

Wheel sizes: 24" (540mm)

Push rims: 11 mm distance, 6 rivnut fitting required

Spring/loop materials: Carbon composite with plastic sleeve

Rim: double-walled aluminium, black

Inner rim width: 16 mm

Hub: Die-cast aluminium, anodised graphite grey, Sealed cartridge bearings

Bearing width at faces: 47,5 mm

Wheel weights: 5,7 kg.

Minimum user weight: 50 kg

Maximum load (user and chair): 120 kg

Tyres: Schwalbe Marathon Plus, Pneumatic

Total width of the wheelchair: Loopwheels increase the total width with 24-30 mm



Over 95 % of the customers rate Loopwheels as high or very high quality

Over 85 % of the users felt positive about Loopwheels after using them for 2 weeks

Over 80 % of the customers said they'd chosen Loopwheels to reduce the amount of vibration they experienced in their wheelchair

## Loopwheels facts

### How Loopwheels reduce vibration by up to 70%

Overall, Loopwheels significantly reduce the amount of harmful whole body vibrations a wheelchair user will face. In turn, this reduces pain and fatigue and lets them travel further.

### About whole body vibration

Studies have shown that wheelchair users are exposed to levels of vibration that are considered unsafe and that this can affect health and life quality<sup>1</sup>.

It is a significant risk factor for those with spinal disorders, increasing the amount of muscle fatigue and potentially damaging connecting nerves<sup>2</sup>. Vibration is also believed to have significant impact on pain, the development of pressure sores, spasticity and general discomfort. It limits the time, distance and surfaces that users will consider for manual chair use.

Vibration is higher on rougher surfaces and at higher speeds, for example when using a hand bike attachment off-road.



Alleviating pain



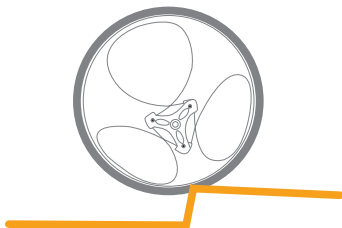
Spend more time with friends



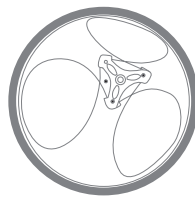
Increase Mobility

### Innovative in-wheel spring

Loopwheels use carbon composites to create an 'in-wheel' spring to absorb vibration, without the weight penalties of a suspension chair or the cost penalties of a full carbon frame.



Kerbs are less of an obstacle with Loopwheels. Loopwheels reduce jolting, soften the impact of landing, and so can help manage pain.



Up to 70 mm of movement to reduce jolts.

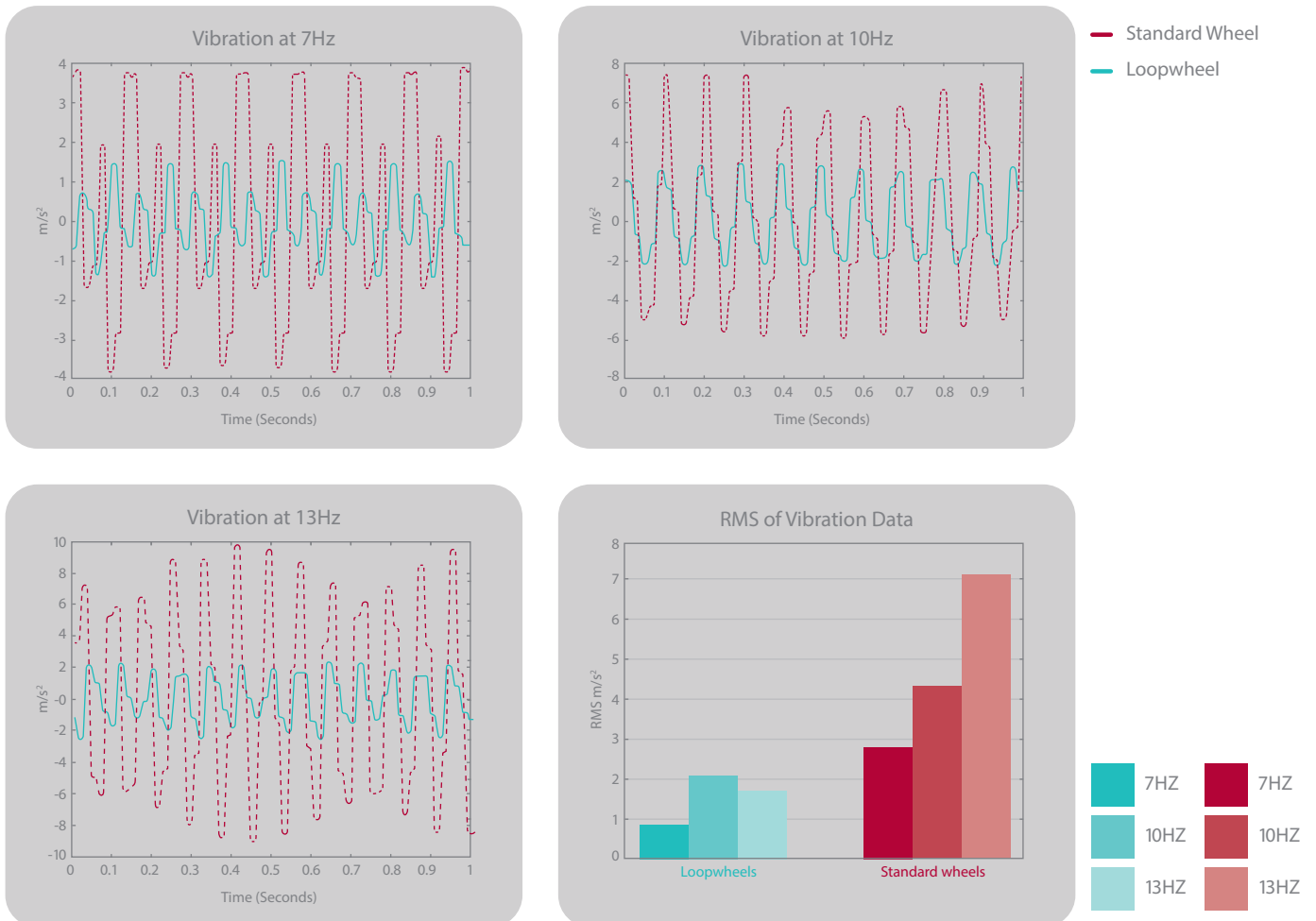


The constant rumble and vibration from bumpy roads is tiring and can cause you problems. Loopwheels reduce vibration on average 65% compared to traditional spoked wheels.

# LOOPWHEELS CLASSICS

## Results of the vibration studies

Raw acceleration data was plotted for all three conditions along with RMS (Root Mean Square value).



Loopwheels were shown to reduce vibration by 68% at 7Hz, 52% at 10Hz and 76% at 13Hz.

## Method for vibration test

To test vibration reduction qualities of Loopwheels, it was compared to a standard metal-spoked wheel that is usually the original equipment found on a wheelchair.

The wheel is positioned directly over the vibration plate.

The wheel is loaded with a weight (10kg). An accelerometer is positioned on the frame holding the load. The accelerometer measures the vibration coming through the wheel. Each wheel was tested at 3 different frequencies (7, 10 and 13 Hz). This frequency range was chosen as this has been shown to be in the range of the most prob-

lematic frequencies for human health (1-20Hz)<sup>3</sup>. To make sure all comparisons were equal, all wheels had the following specification:

- 24" wheelchair size (BSD: 540mm)
- 1/2" bearings, taken from the same production batch (manufactured by MBL)
- Schwalbe Marathon Plus Tyres
- Schwalbe Schrader inner tubes
- Tyre pressure: 110 psi
- Black aluminium powder coated push rims (wide offset)

# LOOPWHEELS CLASSICS

## Results of rolling distance studies

Rolling resistance with Loopwheels is as good as a spoked wheel.

It was proven that a wheelchair with Loopwheels rolls just as well as a chair fitted with a spoked wheel. In developing the Loopwheel suspension system to minimize vibration, one of the key considerations was not to absorb too much forward energy and hence reduce momentum. The Loopwheel were tested against a spoked wheel to examine the rolling resistance.

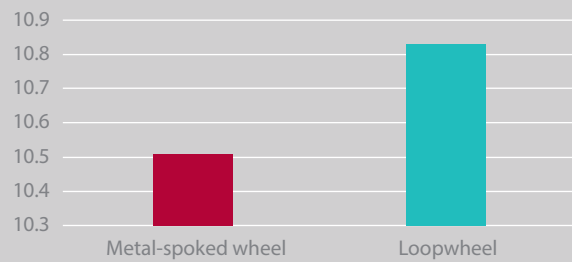
## Method for rolling resistance test

The wheelchair was positioned at the top of a low ramp. It had a pair of identical wheels and the same rider was used in each test. The rider weight was 68,2 kg in each test. All the wheels for the test have the same MBL 1/2" bearings, tyres and air pressure. The rider allowed the wheelchair to descend the ramp without any input. The wheelchair was left to roll along a level tarmac surface until it came to a stop. The test was performed for both Loopwheels and standard metal-spoked wheels. The tests were carried out consecutively and completed within an hour, in dry conditions and with no discernible wind.

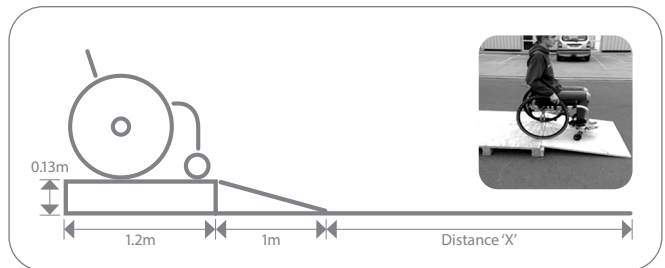
## Results

The Loopwheel rolled the furthest for an average of 10,83 m, the metal-spoked wheel rolled 10,51 m. Both wheels perform equally well; the small differences in distance rolled were probably due to differences in the weight of the wheel.

Distance travelled (metres)



Wheel type	Distance travelled (metres)
Metal-spoked wheel	10,51
Loopwheel	10,83



## Studies

1. Vorrink SNW, Van Der Woude LH V, Messenberg A, Cripton PA, Hughes B, Sawatzky BJ. Comparison of wheelchair wheels in terms of vibration and spasticity in people with spinal cord injury. Assist technol Res Ser. 2010;26:51-53. doi:10.3233/978-1-60750-080-3-51.
2. Garcia-Mendez Y, Pearlman JL, Boninger ML, Cooper RA. Health risks of vibration exposure to wheelchair users in the community. J Spinal Cord Med. 2013;36(4):365-375. doi:10.1179/2045772313Y.0000000124.
3. Katu US, Desavale RG, Kanai RA. Effect Of Vehicle Vibration On Human Body – RIT Experience.

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