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Title:

Gait rehabilitation by outdoor rhythmic haptic cueing using wearable technology for neurological conditions: a case study

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Structured abstract:

Background
For people with neurological conditions such as stroke and brain injury, gait rehabilitation can lead to a significantly more independent lifestyle. Existing gait rehabilitation studies with stroke survivors using rhythmic haptic cueing via wearable devices have demonstrated improvements in temporal symmetry, increase in stride length and walking speed. However, these studies have been limited to laboratory settings and focused on short-term improvements only. By contrast, we present results from the first longitudinal case study on the self-managed use of wearable haptic devices for gait rehabilitation via entrainment in outdoor settings.

Methods
A longitudinal pilot study was conducted with a brain injury survivor, providing rhythmic haptic cueing using a wearable haptic device for a two-week period. The participant was asked to walk in synchrony to the haptic rhythm at a suitable outdoor setting for a minimum of 10 minutes each day. Gait data was measured before and after the two-week intervention using lab-based IMU sensors.

Results
On comparing the before and after gait characteristics, preliminary results showed improvement in temporal symmetry, walking speed and stride length.

Conclusions
Implications for long-term benefits in gait rehabilitation using rhythmic haptic cueing for various neurological conditions are considered. Improvements in temporal symmetry, increase in stride length and walking speed could improve confidence, independence and overall quality of life for patients, with implications for reduction of costs associated with care and rehabilitation.

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