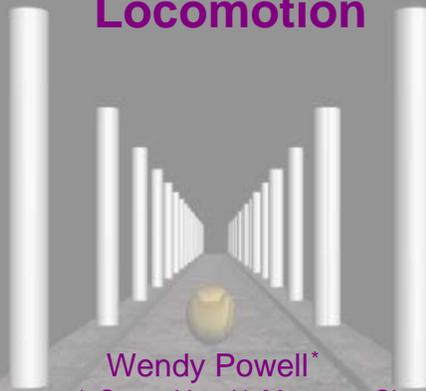


Optic Flow in a Virtual Environment: Sustained Influence on Speed of Locomotion



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Background

- Slow walking and generalised psychomotor slowing are frequent consequences of injury, illness, pain and ageing
- Treadmill training with fast walking speeds can improve walking outcomes
- Lack of motivation, pain and fear of falling can create challenges for treadmill-based therapy

Current Knowledge

- Virtual Reality can be used in rehabilitation to increase engagement, improve movement and decrease pain
- Changes in optic flow can affect treadmill walking speed – no studies on sustained effect

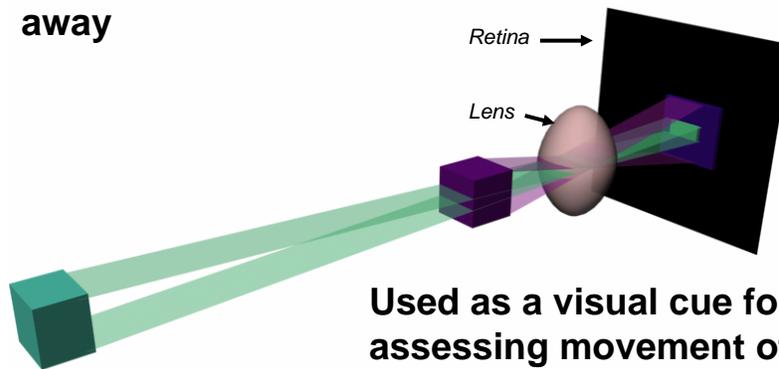
Perception of Movement

- Vestibular (balance, acceleration)
- Proprioceptive (musculoskeletal feedback)
- Cognitive (higher level awareness)
- Visual (e.g. optic flow)

Visual information may dominate other sensorimotor input

Optic Flow

The image of an object on the retina enlarges as it comes nearer and shrinks as it moves away



Used as a visual cue for assessing movement of ourselves or objects in our environment

Experimental Questions

- If subjects walking on treadmill are exposed to mismatched optic flow from a stereoscopic animation, will their walking speed be influenced?
- If an influence is found, can it be sustained for up to 5 minutes?

A large-screen stereoscopic display with optic flow creates a feeling of self-motion



Experimental Setup

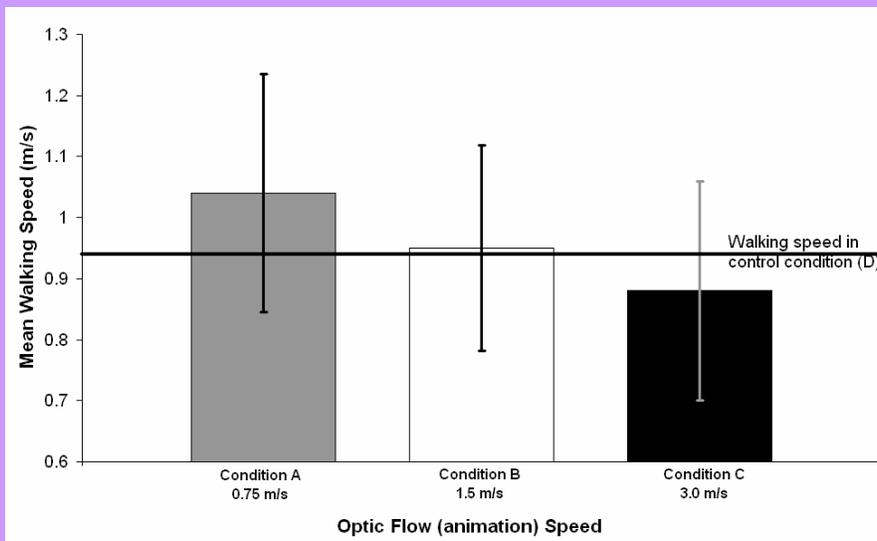


Non-motorised treadmill in front of a 5m wide stereoscopic display

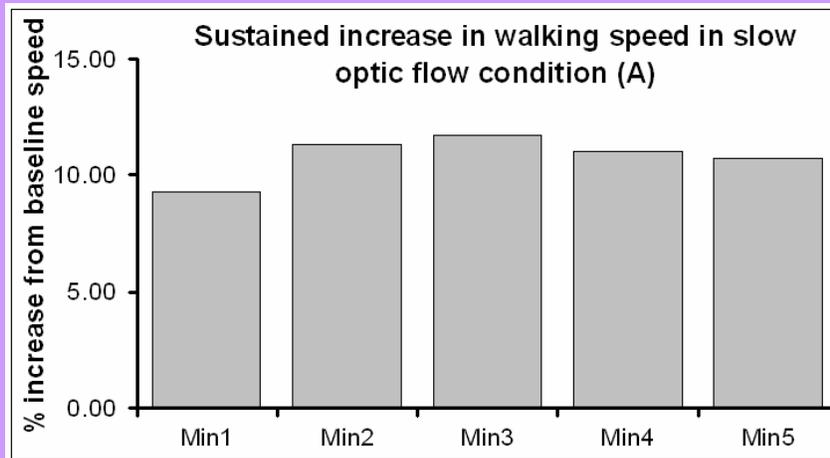
Pilot Study

- Participants (n=9) walked for 5 minutes at a steady pace on self-driven treadmill in front of 5m wide display
- Animation displayed at 0.75, 1.5, 3 m/s or static image
- All participants walked in each of the four conditions (counterbalanced order)

Results



Error bars represent standard deviation of walking speeds of subject group - consistent between tests



Summary

- In slower optic flow conditions participants walked faster (and vice versa)
- Significant differences in walking speeds between optic flow conditions persisted for the duration of the optic flow stimulus
- Reducing the rate of optic flow in a Virtual Environment will facilitate the treatment of locomotor slowing in a variety of disorders.