

## 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

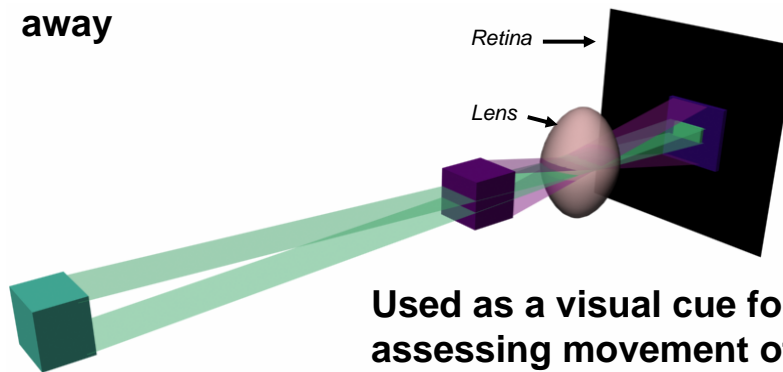
## Perception of Movement

- 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

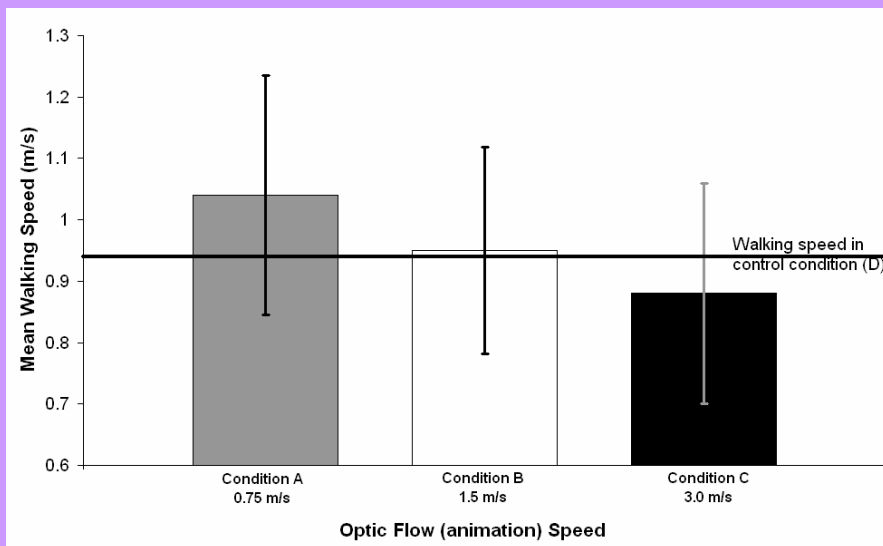


Non-motorised treadmill in front of a 5m wide stereoscopic display

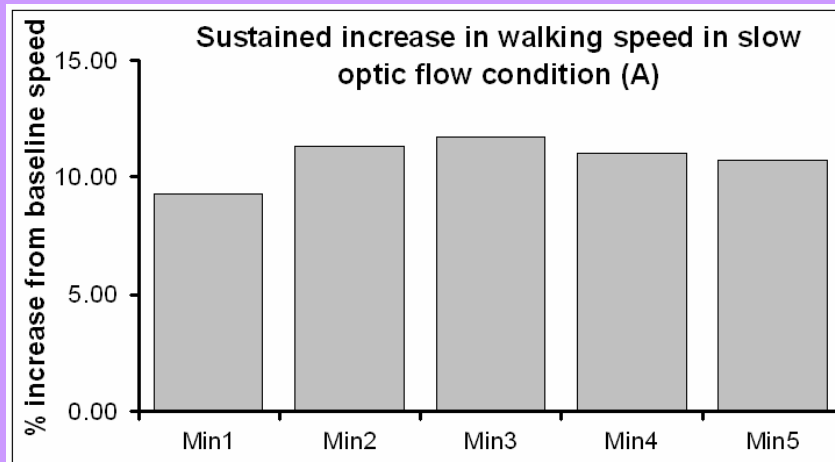
## Pilot Study

- 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.