The Hopes and Challenges of a Bionic Eye: Implications for Education and Learning

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How Does Vision Work?

Common Causes of Vision Loss

Vision Restoration Options
1. Retinal Prostheses (“bionic eyes”)
2. Stem cells
3. Gene therapy
4. Optogenetics

Currently Active International Vision Prosthesis Groups

Groups highlighted in red are currently undertaking human clinical trials
The Bionic Eye

Bionic Eye Locations

What Will It Look Like?

Phosphene Vision

How Does It Work?

Phosphene Vision

What will a person with a retinal implant see?

16/01/2015
BVA Prototype Study

24 stimulating electrodes
No implanted electronics
Materials: platinum and silicone
Suprachoroidal surgical placement
3 patients with profound vision loss from retinitis pigmentosa (light perception only)
2 year study

Optical Coherence Tomography

Psychophysics

O&M and ADL Testing

Likely Benefits of Bionic Eyes – Short Term

- Light perception
- Object detection and avoidance
- Visual certainty
- Social cues
- Enjoyment
Possible Benefits of Bionic Eyes – Long Term

- Higher resolution
- Reading large print?
- Face recognition?

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Likely Benefits – Short Term

- Beneficial to people with very specific causes of vision loss (genetic)
- More “natural” restoration of vision
- Promising initial trials

Likely Benefits – Long Term

- Likely to be beneficial to people with earlier stages of vision loss
- Unlikely to be of benefit for profound vision loss
Neuroplasticity

• William James – 1890

• Plasticity = intrinsic property of the nervous system throughout life

• Evidence that the vision related areas of the occipital cortex are re-wired in a compensatory cross modal manner in people who are blind

Neuroplasticity

• In experiments, five days of blindfolding is enough to show changes in auditory and tactile mapping in the visual cortex

• This means it is likely that the cortical connections were already present, and are just “unmasked”

Neuroplasticity

• Likely to improve outcomes in vision restoration interventions (as has been shown in cochlear implants)

• Possible avenue for other therapies

• Important area of research

How to Keep Updated

• Contact us directly: lnayton@unimelb.edu.au

• www.artificialvision.org

• Low vision support agencies

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Our research participants (and their families and friends)